ELECTRICAL REVIEW

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D.C. Transmission

WHILE the long-established position of alternating current for large-scale generation and distribution of electricity is unlikely to be challenged, doubts have arisen in recent years as to its part in transmission schemes of the future. Such doubts have their basis in the pronounced trend towards sending increasing amounts of power over longer distances, which introduces difficulties regarding system stability when the power per circuit exceeds the surge impedance load of an overhead line. The preferable alternative to the use of costly and largely untried stabilizing devices is to raise the voltage (which has tended to be doubled every twenty years), but this brings troubles due to corona loss, with the accompanying need to increase the number or diameter of conductors, and of interference with electrical communications. Hence the attention that has been paid lately to the possibilities of d.c. with its freedom from reactive-current problems.

The case for d.c. was broadly presented in a paper given in 1948 by Mr. F. J. Erroll and Lord Forrester at the Institution of Electrical Engineers. In it prominence was given to a further aspect, that of the great superiority, technical and economic, of d.c. high-voltage cables, especially for such duties as underwater connections. Consideration has been given to the subject as a whole at C.I.G.R.E. and elsewhere and exploratory work to the extent of its limited resources has been done by the Electrical Research Association. The E.R.A. has now compiled a report on the present stage and future prospects of d.c. (reviewed in this issue) which is based on informed opinion from numerous sources. There is no questioning the merits of a.c. for conditions now prevalent. What is debatable is the distance beyond which d.c., with its cheaper overhead lines and more expensive substations, would show to advantage compared with a.c., in which the incidence of expenditure is reversed. An immense amount of research will be necessary before convertors of the requisite capacity can be produced commercially. Although the

non-existence of d.c. circuit breakers may restrict the use of d.c. on the interconnected network of this country, the list in the E.R.A. report of point-to-point long-distance projects that might be feasible with d.c., although hardly with a.c., in undeveloped parts of the world indicates profitable opportunities for regaining the initiative in d.c. transmission given to Britain by Mr. J. E. Calverley and the late Mr. W. E. Highfield 30 years ago. To compete with other countries in modern conditions manufacturers must be enabled to gain the requisite experience on the general lines of the E.R.A. proposals.

BACK-PRESSURE STEAM

The reasoned case for district heating in appropriate circumstances put forward by Mr. A. E. Margolis at the Institution of Engineers-in-Charge, reported in this issue, was a welcome change from the super-optimism of many public references to the subject. Much of the gain in thermal efficiency, however, may be expected to go towards increasing comfort rather than fuel saving. The author's reference to the choice of modern power stations as the source of heat on account of their use of poor qualities of fuel is relevant to another topic of the moment, as it is not often remembered that such coal, unlike the kinds used to produce heat in other ways, is unsuitable for export or home industry.

"UNADULTERATED NONSENSE"

By denial of materials and by the imposition of a heavy purchase tax on their products the refrigerator makers have been forced to produce largely for export. They have been very successful and during the past five years their exports have increased sixfold. Now they find themselves faced with the virtual loss of one of their best customers—Australia—and with threats of further losses by reason of the necessity for these customers to redress their trade balances. Yet, at the same time refrigerators are being imported into this country from the Continent and (more strangely) from the United States. Mr. E. G. Batt considered this to be "sheer unadulterated nonsense" in his speech at last week's annual luncheon of the British Refrigeration Association. We must agree that it certainly looks like that. The recent amendment to the Open General Licence removes from the licence only refrigerators of a capacity exceeding 7 cu ft which still lets in the bulk of domestic types.

DOMESTIC APPLIANCE SUPPLIES

So far as the electrical industry is concerned the new restrictions imposed on imports appear to be of no great significance except, perhaps, for some individual importers. The amount of purchases of domestic electrical equipment from abroad has not been very great (probably £1½ million, including lighting equipment, in 1951) but the disabilities suffered by British manufacturers through shortage of materials might have led to a bigger influx, particularly from Germany. Reduction of imports by Australia (and maybe by other Commonwealth countries later on) may result in "frustrated exports" being placed on the home market if the appliances cannot be disposed of elsewhere.

GUARDS ON FIRES

The general approval given by the House of Commons to Mr. D. Bullard's Bill for enforcing the fitting of guards to electric and gas fires suggests that the Bill will become law. Reputable makers of electric fires are already anticipating the regulations by providing guards and it is therefore desirable that others should be brought into line. Guards will add to the cost, of course, and in this connection it would be fair to make some adjustment in purchase tax. It is unreasonable that the 100 per cent tax should be applied to the guard as well as to the fire.

New Printing Works

Up-to-Date Electrical Installation at Nottingham

ONE of the largest works owned by an industrial company to cater exclusively for its own printing requirements is now being completed by Boots Pure Drug Co., Ltd., at Nottingham. About two-thirds of the 240,000 sq ft of floor area has already been equipped and brought into service and the remainder will be ready for occupation this year. The new works occupies the site of a previous printing works demolished by enemy bombing in 1941.

As in the case of the company's other recently opened factory, at Airdrie (see *Electrical Review*, 14th April, 1950), special attention has been paid to the lighting arrangements. The electrical installation also embodies many other features of interest both in the application of electricity to printing problems and in the way the scheme has been carried out by the company's Engineering Department.

The factory receives its electricity supply at 11 kV by looping in a three-core 0·1 sq in p.i.l.c. s.w.a. cable connecting the company's private power stations at Nottingham and Beeston. The two stations are about four miles apart and feed into an 11 kV ring main. In the printing works substation the ring main is connected to the outer panels of a four-panel B.T.H. 400 A 150 MVA switchboard, the ring main breakers being fitted with directional protection against overload and earth faults. Short circuit fault capacity should not exceed 70 MVA at the h.v. busbars, but since 150 MVA B.T.H. switchgear has recently been acquired for the power stations this size

Colour matching fluorescent lamps have been employed throughout the production area. This picture of the litho department shows the 3-lamp fittings used and also the roof structure. The temporary screen on the left will be removed when the remaining section of the building is completed

is also being used as standard in the substations.

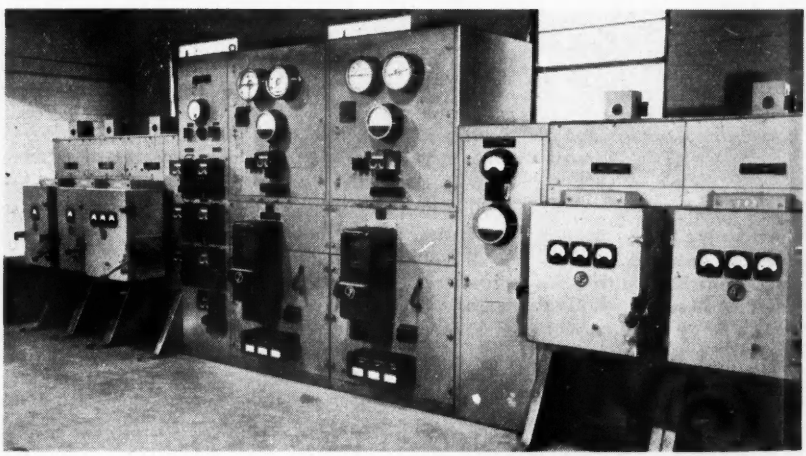
The two inner panels are connected to two Hackbridge & Hewittic 1,250 kVA 11,000/420 V indoor type transformers, delta-star connected with neutral brought out and tappings on the h.v. side for ± 2½ and 5 per cent adjustment by means of an externally operated off-load switch. The two transformer houses are specially designed for adequate natural ventilation, the air being brought up from the cable trenches round the transformers through gratings and out through a square section chimney above the transformer. The cable trenches are of adequate depth so that graded pebbles can be put in to act as a soak-away for the oil if necessary.

Further protection is afforded by having steel shutters over the air intakes which are held open through a fusible link: if these shutters close a warning is given in the power station. Both overload and earth leakage protection is provided, the panels for the transformers also being equipped with relays for magnetic balance protection. To operate the protective relays 24 V d.c. is provided by a "Nife" steel-clad tripping battery unit which has a high- and low-rate charger. The positions of the 11 kV switches will be indicated on the control board in the Nottingham works power station.

From the transformers the l.v. supply is taken to Johnson & Phillips 2,500 A, 30 MVA oil circuit breakers having triple pole PBO relays with three overload elements. The neutral earthing panel associated with these circuit breakers is provided with an earth leakage indicator with alarm contacts to operate a warning light on the Nottingham power station control board should an earth fault exceed a certain value. The eight remaining panels, which go to make up the eleven-panel l.v. switchboard, comprise three 800 A units handling the power (two) and lighting supplies, four 400 A switches for the borehole water and air conditioning (two each) and a metering panel. The seven feeder panels are withdrawable type SFD air circuit breakers and have back-up protection by h.r.c. tripping fuses. Earth leakage striker fuses are fitted which give a light indication when the strikers have operated; they are not arranged to trip the breakers.

With the exception of the borehole water and air conditioning plant which is served directly by the main substation, all the services, plant and lighting are fed from the centre of the building through a switch room housing two Johnson & Phillips 420/240 V air break switchboards, one for lighting and one for power. The 400 V three-phase four-wire lighting switchboard comprises an 800 A draw-out circuit breaker for the incoming supply

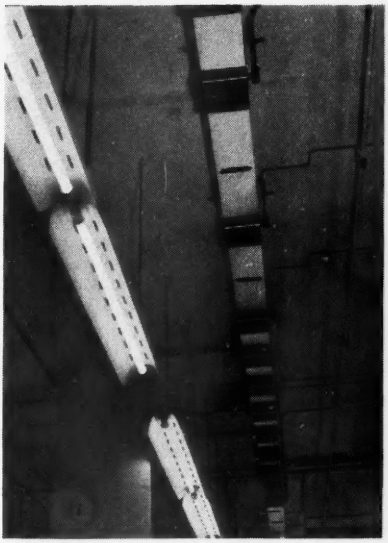
The main low voltage switchboard comprises J. & P. oil and air circuit breakers



and four outgoing units, each rated at 200 A. Three 100 A four-way and one 100 A eight-way t.p. and n. fuseboards incorporated in the switchgear fed from the four 200 A circuit breakers control the lighting supplies throughout the whole of the building.

The power switchboard comprises two 800 A incoming units with an off-load 800 A four-pole busbar section isolator between, and fifteen outgoing 200 A units, eight above and seven below the busbar chamber. All the outgoing units, both lighting and power, are fitted with h.r.c. and earth leakage striker fuses arranged to trip the breakers on earth fault at a certain proportion of the breaker rating and to operate an amber indicating light.

With the exception of two circuit breakers which feed t.p. and n. fuseboards serving the stereotype, monotype, compositors' and photo-litho departments, all the outgoing power units feed various sections of an English Electric type RR busbar system totalling altogether 3,036ft. These busbars, which have a capacity of 250 A, are made up of 253 12ft lengths each of which has provision for six outlets. The plug-in back connected boxes are fitted with 30, 60 or 100 A h.r.c. fuses. Plant on the ground and first floors is supplied from the busbar system suspended from the ground floor ceiling. Plant on the second floor is supplied from busbars on the first floor ceiling. "Rigifix" slotted inserts support the busbar system and the cable runs to the various rows.



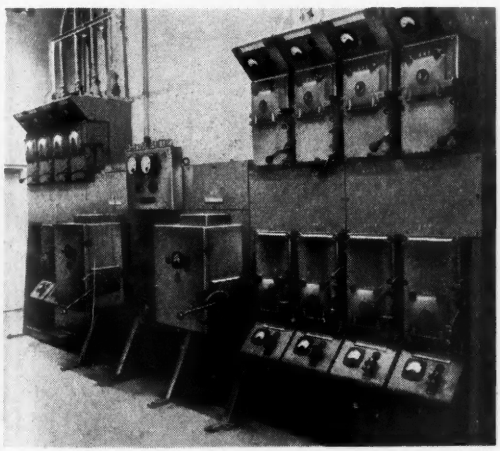
Plant on the ground and first floors is supplied from a busbar system suspended from the ground floor ceiling

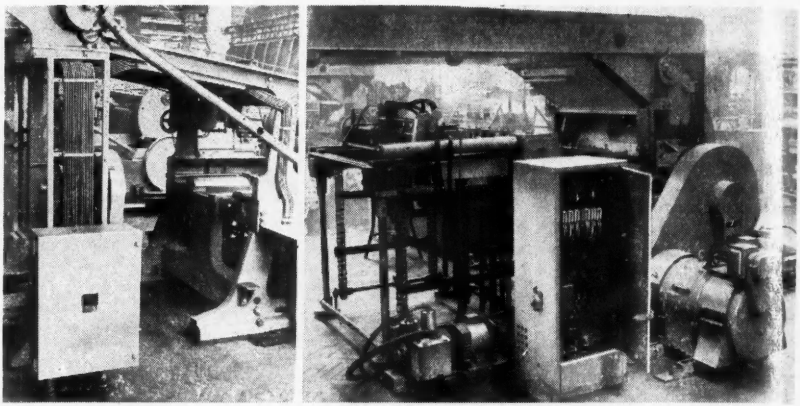
The p.i.l.c. s.w.a. cables were supplied and installed by British Insulated Callender's Construction Co., Ltd. Inside the building the steel wire armoured cables were left unserved for the sake of appearance; approximately 2,500 yd of paper insulated cables have been used and approximately 1,200 yd of main telephone cables.

In order that the machinery on the first and second floors may be fed from the plug-in boxes on the ceiling of the floor below, a network of 1in diameter holes has been provided in the floor slabs, generally at 6ft by 5ft centres. The holes not required are concealed by the wood parquet blocks with which the floors are covered. Besides facilitating the rearrangement of equipment, this scheme has the advantage of eliminating unsightly cabling and conduit.

Appearance, as well as

Power switchboard in the central switchroom





Left: **Pyrotenax cabling is used extensively on the printing machines. Here it is seen on a Swedish G.M.A. quad-crown single-colour machine.** *Right:* **Rotary sheet feed carbon machine showing controller incorporating injection braking panel and also variable speed commutator motor**

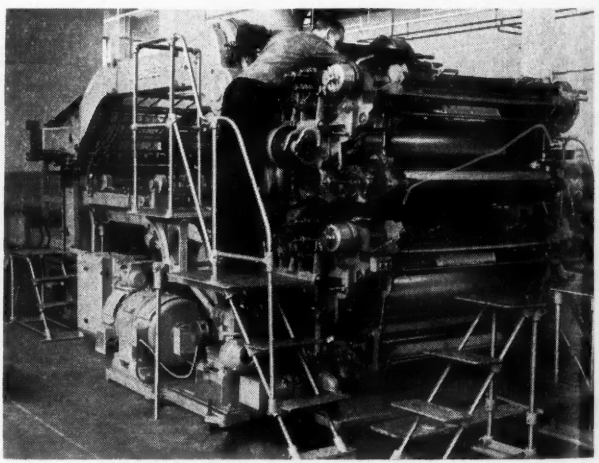
robustness, has also been one of the considerations which has led to the widespread use of Pyrotenax mineral insulated cable for feeding the printing machinery from the plug boxes; in addition it has facilitated wiring on the intricate machine frames. The Pyrotenax cable is also resistant to the oil or ink which often finds its way into a conduit system. Approximately eight miles of this type of cable has been employed so far throughout the building.

All the printing machinery is operated on a.c. whereas the former works operated on d.c. This change-over has presented some difficult problems especially where rapid stopping is necessary as a safety measure and in the case of certain work involving numbering, which necessitates stopping within half a revolution of the machine cylinder. These have been overcome by injecting d.c. from rectifiers into two phases of the three-phase commutator motors.

B.T.H. Co. printing drives have been employed wherever possible and have been supplied by the sole distributors, Electrical Drive Applications, Ltd., who have also been responsible for the controllers used on nearly all auto-pre-set variable speed motors and slipring motors and controllers on printing machine drives. Crabtree starters are used for fixed speed and hand-operated variable speed motors.

Special resistances had to be designed for controlling the speed of the slipring motors

Crabtree quad-demy two-colour lithographic printing machine



driving some of the platens, an extra section of resistance being automatically put into circuit when declutching. A heavy flywheel is employed on these presses which has to be slowed down when the machines are not printing; if the extra resistance were not inserted the flywheel would build up too much stored energy and printing would be too rapid when first engaging the clutch.

The control of the quad demy two-colour offset press (illustrated) is typical of many letterpress and lithographic machines. The machine is driven by a 12 h.p. 1,440/360 r.p.m. B.T.H. commutator motor controlled by an automatic starter. The position of the brushgear is controlled by a pony motor which is in turn governed by limit switches and the push-button stations situated at various parts of the press. Upon the " run " button being depressed, the machine will accelerate until it reaches its pre-set speed whereupon the pre-set speed limiter cuts out.

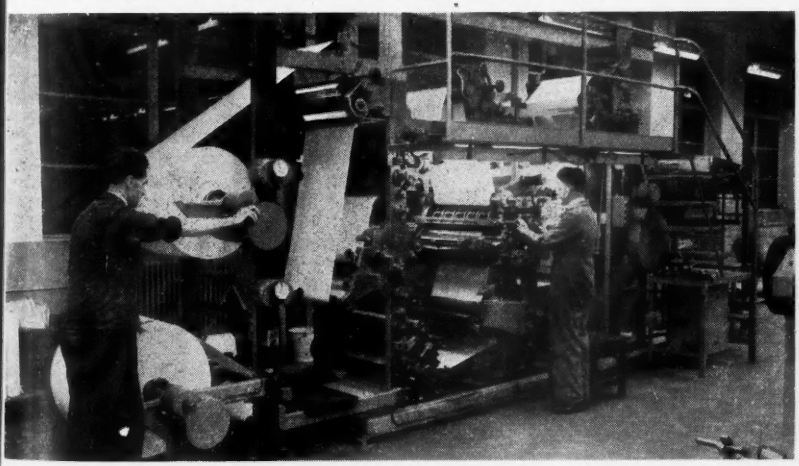
Once the best running speed for the particular job on the machine has been decided upon by the machine shop foreman, the limit switches can be set with a special key, after which each time the machine is started it will run at the correct speed without further adjustment. " Speed-up " buttons are provided to permit the machine to be run above the pre-set speed and " slow-down " buttons will take the machine back to the pre-set speed, while the " inch " buttons will run the machine at its lowest speed.

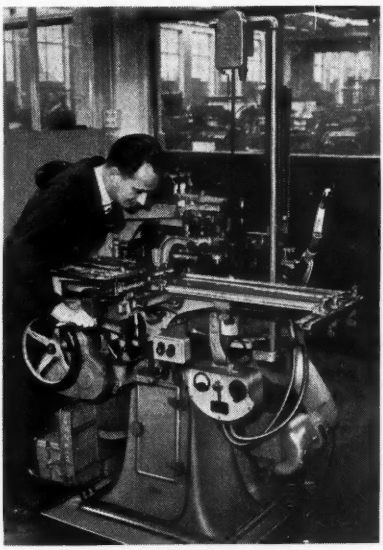
For safety there are stop buttons at all vantage points and braking is provided by a 4in electromagnetic brake on the coupling between main motor and gear box. A 2½ h.p. 1,465 r.p.m. B.T.H. motor drives the automatic feeder. Micro switches have been incorporated for stopping the machine if more than one sheet is fed into the cylinder at a time. Crumpled sheets will also stop the machine. Four 15in fluorescent lighting fittings provide local illumination on the rollers and feed board.

The rotary counter book machine driven by a 10 h.p. 1,450/360 r.p.m. commutator motor (also illustrated) is controlled in a similar manner. Four 4ft fluorescent fittings placed inside the machine illuminate the complete set of rollers to facilitate re-papering.

The rotary carbon machine is driven by a 10 h.p. 1,456/360 r.p.m. commutator motor, the control being similar to that of the quad demy two-colour offset machines except that d.c. injection dual braking is provided for inching and normal running; a " crawl " push-button is also added. The braking is needed because the machine is usually on numbered work and therefore synchronization is important. The chaser, oil pump and feeder are driven by 1 h.p. 1,425 r.p.m., 2 h.p. 1,420 r.p.m.

This machine prints and numbers counter bills in duplicate. It has run, crawl and inch controls





This Monotype casting machine is fitted with a time switch. By this means the metal is melted in readiness for starting work in the mornings

and 0·33 h.p. 1,420 r.p.m. motors respectively, all controlled by Crabtree starters with isolators and h.r.c. back-up protection. Heating current is applied to the carbon rollers through sliprings and is thermostatically controlled; time switches are provided for early morning switching on. Crabtree contactors control the heating circuit. Machine lighting is provided by two 15in fluorescent units.

The Monotype casting machine is driven by a ½ h.p. 960 r.p.m. motor and controlled by a Crabtree DL starter. The heater circuit is fed from a 15 A splitter switch, which also supplies a 5 A switch plug. Correct metal temperature is maintained by a mercury thermostat and a time switch is incorporated to enable the operators to begin immediate production at the start of normal working hours. The time clock is connected to an M.K. fused point.

A plating plant has been supplied by W. Canning & Co., Ltd. For the copper plating a Westinghouse selenium oil immersed rectifier gives an output of 1,050 A at 7 V d.c., the transformer primary being suitable for a 400 V supply. An air cooled auto-transformer for voltage control has 63 steps. The nickelling tank is supplied by a motor generator set giving a 6 V 100 A d.c. output. A smaller tank for copper plating before nickelling is served by the same generator. All the tanks are fitted with silica-sheathed, thermostatically controlled immersion heaters.

In the photo-litho department six 50 A a.c. carbon arcs are installed. Four of these are used in conjunction with a camera, the shutter of which is controlled automatically by means of a Baldwin light-meter to compensate for any voltage or light variation of the arcs.

Throughout the factory the lighting installation has been planned to conform to or exceed the Illuminating Engineering Society's code of average intensities and the original plan was based on the use of " daylight " fluorescent lamps (" Mazda ") in B.T.H. fittings. The main lighting problem was in the letterpress and litho departments where the spacing of the fittings was determined by the roof structure. To keep the roof clear, the rows of three-lamp lighting fittings had to be spaced 24ft apart while to give sufficient overlap they had to be mounted 21ft high.

Besides conforming to æsthetic requirements this high mounting arrangement eliminates any possibility of discomfort glare. Continuous rows of two-lamp 5ft fittings would have given an average illumination of 20 ft-candles whereas 25 ft-candles was called for. It was therefore decided to use three-lamp 5ft fittings, still retaining the continuous rows of fittings, to give 30 ft-candles on the working plane.

This decision resulted in an unforeseen advantage for, after the installation was commenced, a colour matching lamp became available which was found to be particularly applicable to colour printing work and was therefore adopted throughout the installation. The light output of these colour matching lamps is 20 to 25 per cent less than that of the daylight lamps so that the final scheme does in fact provide an intensity of light very close to that originally provided for, actual tests showing an average illumination of about 24 ft-candles.

In view of the difficulty of securing accurate alignment of the long continuous rows of fittings, the reflectors chosen are curved at the ends and are independent of adjacent reflectors, any slight misalignment thus not being apparent. Adjustment for

alignment was mainly taken up on brackets fixed to the continuous roof member below the valley of the north light roof structure. Two of the main machinery areas, each 168ft by 140ft, are free from columns. The north light roof structure over these areas is an all-welded " Diagrid " type fabricated on site.

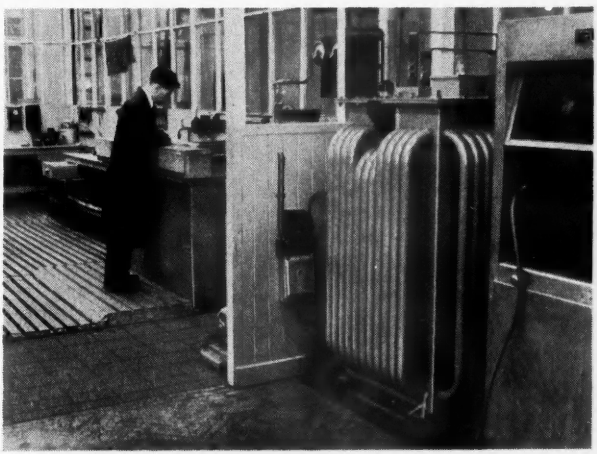
The absence of columns and trusses in these areas presented difficulties in the planning of the engineering services but the result is pleasing because of the absence of services passing across the 24ft spans between the valleys, and the absence of vertical services between the machinery and the roof structure. The air conditioning ducting and sprinklers are fixed on the south slopes of the roof and although the ducting in some places measures 5ft by 2ft 2in it is quite unobtrusive. The appearance of spaciousness in the buildings during hours of artificial illumination has been maintained by slotting the fittings to give a small amount of upward light.

To facilitate maintenance of the continuous lines of fittings the spines of the fittings are connected by simple catches on the outside. Supported by hooks and chains and wired independently and supplied by means of a plug and socket each fitting can therefore be easily disconnected from its adjacent fittings and readily removed.

Any possibility of danger arising on moving machinery due to stroboscopic effect is eliminated by the adoption of a special circuit for the fittings, and different rows of fittings are arranged on different phases of the supply. Switching in general covers groups of fittings so that rows of lights in the centre of the building can be switched on at different times from those nearer the outside windows and vice versa. A photo-electric control unit gives a warning that the artificial lighting can be switched off when the daylight intensity reaches a certain value.

For local lighting where required and on machines to supplement the overhead artificial lighting or daylight, 15 W 18in or 20 W 2ft fluorescent fittings have been installed. The basement, which is used for heating and sprinkler purposes, is illuminated to an average intensity of about 6 ft-candles by tungsten lamps in plastic reflectors giving a fairly high proportion of upward light. Internally silica sprayed lamps have been used to reduce glare and the wiring is carried out in Pyrotenax cable. At present tungsten lighting by G.E.C. " Wembley " lanterns is used for the roadways but when the building is completed it is proposed to change over to dual mercury-tungsten lamps in the same fittings slightly modified which will blend better with the internal lighting of the works.

The entrance hall lighting was designed by B.T.H. engineers in conjunction with Boots architects and will comprise a large louvred centre panel flush with a suspended ceiling. Batten type fluorescent fittings are fitted above to give an illumination of 8 to 10 lumens per sq ft. This lighting will be supplemented by means of fittings placed behind glass brick walls. The offices are illuminated to an average intensity of 20 lumens per sq ft by single or twin 5ft fluorescent fittings with sandblasted " Perspex " visors and in some cases with fluted " Perspex " sides combined with



A corner of the Electrotyping Department

centre louvred panels. Colour matching lamps have been used throughout the offices as well as the works.

Altogether about 2,700 lighting fittings for general lighting purposes will be installed involving about 3,700 lamps. Approximately 350 three-lamp 5ft fittings, 340 two-lamp 5ft and 1,300 single-lamp 5ft fittings will be required, the remainder being 4ft single and twin 2ft fittings; there are 260 tungsten lamps. In addition about 210 fluorescent fittings and 40 tungsten fittings will be required for local lighting.

Portable 230/24 V transformers used in conjunction with portable handlamps are fitted with flexible leads and Reyrolle two-pin 5 A plugs with scraping earth contact. Throughout the building there are 180 5 A and 80 15 A B.S. switch sockets, rubber plug tops being used on all portable equipment. In addition about 90 Walsall 400 V three-phase switch sockets are installed, the neutrals having been taken into the 400 V sockets so that 230 V switch sockets suitably fused could be incorporated in the same housing.

Five Express lifts have been provided. Four of 2 ton capacity travelling at 100 ft/min are operated on the "Trulevel" system whereby a single speed squirrel cage 14 h.p. motor is used for the main drive and a smaller single speed s.c. motor for the levelling. The fifth lift is designed for either 5 tons at 50 ft/min or 2 tons at 150 ft/min. Normally this lift will operate at the 2 ton loading and on the occasions when the 5 ton capacity is required a 1½ ton weight fixed below the car is released by the lift driver by means of a lever under a trap-door in the car floor.

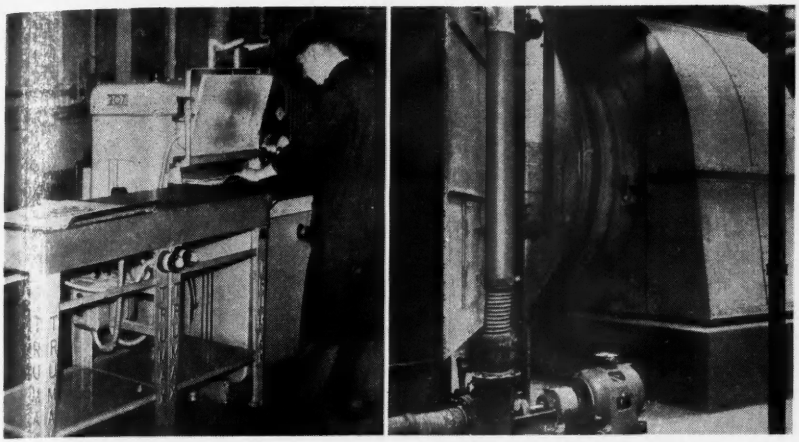
For acceleration and for full speed running at 2 ton at 150 ft/min there is a 20 h.p. single speed s.c. motor, the levelling being undertaken by a 17 h.p. change-pole motor working on its low speed winding. When running at 5 ton at 50ft/min the acceleration and full speed running are carried out by the change-pole motor working on its high speed winding, levelling being operated on the low speed winding. The single speed s.c. motor is idle when the lift is operating at 5 ton capacity.

Control is by means of push-buttons on the landings and in the cars, the power operated rise and fall doors being synchronized with the landing doors. All the lifts are supplied from plug-in boxes (100 A) on the busbar system through English Electric t.p. and n. fused switches and emergency isolators. Six Potter Rax power operated doors between various sections of the works are actuated by rubber floor pads. One 2 ton "Conveyancer" battery driven stacking truck is utilized.

For communication within the building there are eleven G.P.O. 'phones and fifty-nine Ericsson automatic departmental 'phones supplemented by a Gents 12-way illuminated call board system and a G.E.C. public address system comprising forty-seven loudspeakers. A Lamson tube system is also installed for interdepartmental correspondence. The fire alarm scheme includes fifteen switches, twenty-five alarm bells and eight Klaxon alarms. The International impulse type clock system, for which three rectifier and relay units are provided, incorporates ten checking clocks and thirty-three single-, double- and four-dial slave clocks of from 8in to 24in diameter.

A complete air conditioning, ventilating, heating and hot water supply scheme is in course of construction by Young, Austen & Young, Ltd. Most of the air conditioning

"Conveyancer" fork lift truck and electrically operated doors



Left: **Thermostatically controlled hydraulic plastic moulding press.** *Right:* **Air conditioning fan driven by a 48 h.p. variable speed slipring motor. A 15 h.p. motor driving the air washer circulating water pump is shown in the foreground**

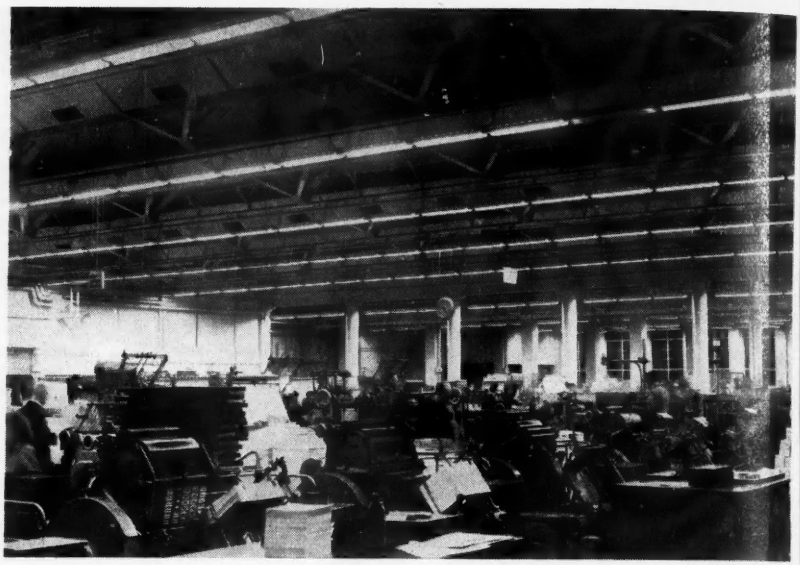
plant is situated in the main plant room on the top floor. The two main air supply fans are driven by Fuller 52 h.p. and 48 h.p. slipring motors, extraction fans being fitted with 38 h.p. and 25 h.p. motors. All four of these motors are equipped with Ellison stator circuit breakers and air cooled rotor regulators. B.T.H. motors drive the air washer pumps (two 15 h.p. and one 2½ h.p.) and the spray pump (5 h.p.). The remainder of the air conditioning plant, to be installed at the other end of the building (not yet completed), will comprise one air supply fan (Fuller 22 h.p. motor), one extraction fan (Fuller 14 h.p.) and an air washer (B.T.H. 7½ h.p.). The humidity of the air is controlled throughout the building for the conditioning of paper.

Two boreholes have been sunk by C. Isler & Co., Ltd., for supplying cooling water to the air conditioning plant. The boreholes are 200ft deep, the bore being of 21in diameter. Pulsometer pumps driven by L.D.C. 85 h.p. 1,470 r.p.m. vertical spindle screen protected slipring motors are to be used, started by Brookhirst stator-rotor automatic starters and controlled by Londex electrode type water level equipment, the start and stop electrodes being 75ft and 180ft below ground level. The outputs anticipated from the boreholes are 30,000 and 25,000 gall/hr.

Water for the heating and hot water services is supplied by a steam heated calorifier situated in the basement. Steam is brought from the works power station at 60 lb/sq in. Three circulating pumps are provided for the heating, one with 2½ h.p. and two with 5 h.p. B.T.H. motors. The domestic hot water service pumps by Holden & Brook are driven by ½ h.p. B.T.H. motors, while the two Worthington Simpson condensate return pumps have 7½ h.p. motors. Londex electrode type water level controls are provided for the condensate.

The temperature of the water in the heating system is automatically controlled with the aid of Rheostatic Co. thermostats, modulator valves and motorized valves. To anticipate changes of temperature that will take place inside the building an outside " weatherstat " operates a motor-operated mixing valve with thermostats inside the building controlling the motor-operated valves in the circuits of the low pressure hot water system. All the motors used for these services are controlled by Crabtree starters.

Fan heaters are employed in some areas, thermostats set at 65 deg F controlling " Satchwell " relays which interrupt the supplies to the heater unit motors. Two sizes of these fan heaters are used, one with a ⅛ h.p. 960 r.p.m. motor and the other with an ⅛ h.p. 925 r.p.m. motor. Overload protection is provided by a " Startet," and Crabtree selector switches permit the units



An average illumination of about 24ft-candles has been achieved in the main machinery hall

to operate in the summer to ensure air circulation without heating.

Fifty-six specially designed hand dryers manufactured by the British Trane Co. are being provided, comprising electrically driven blowers with $\frac{1}{4}$ h.p. three-phase Brook motors, the blowers passing air through batteries of steam-heated coils. The Crabtree starters are situated away from the dryers, isolation being provided only at the dryers. Steam is normally left on so that immediately the foot switch is operated a supply of hot air is available. The heat losses when the fans are not running are very low.

The main switchboard for the air conditioning, ventilating, heating and hot water services situated in the main plant room is of English Electric construction and comprises a length of 300 A t.p. and n. copper busbars split into two sections which can be joined together by means of links bolted solidly. Normally, however, the switchboard is designed for operation in two distinct halves. On the left is mounted the incoming 300 A t.p. and n. distribution board complete with voltmeter and phase-change switch. The right-hand section carries the incoming 300 A switch, five 60 A and one 150 A switch fuses and one 12-way fuseboard with voltmeter and phase-change switch. Local 30 A and 15 A t.p. and n. fuseboards control the supplies to the fan heaters and hand dryers.

In addition to the 8 miles of multicore Pyrotenax and main cables about 67 miles of v.i.r. cable has been used, together with about 14 miles of conduit. Ultimately about 530 motors will be installed, including 61 variable speed commutator motors and 62 slipring motors. No special provision for power factor correction has been made since this is not considered to be justifiable. Other departments included in the printing works that have not been mentioned include carton making, book binding and toilet paper reeling.

The whole of the electrical installation was carried out by the company's Electrical Department to plans prepared by its own engineers. We are indebted to Boots Pure Drug Co., Ltd., for giving us permission to visit the works, to take the photographs which are reproduced and publish this article and we also thank their engineers for their assistance in its preparation.

Engineering in Europe

Survey of Current Literature

THE theory of power factor improvement by static capacitors is comparatively simple and well-known, yet a practical method for conveniently determining the capacitor size for given original and improved p.f.s will be welcome, especially if in the form of a nomogram or abacus. The engineer's problem is mostly not to find one single value for one set of given data, but to get a series of values covering a range of operating conditions which often occur in practice. The most convenient characteristic of p.f. compensation is the factor $\kappa = N_c/N$ (ratio of required compensating kVA to uncompensated kVA) which may be expressed in terms of the non-compensated and compensated phase angle thus: $\kappa = \cos \phi (\tan \phi + \tan \phi_{comp.})$, where only negative values of $\tan \phi_{comp.}$ should be considered. This relation is evaluated by a nomogram and the comparison with a graph developed in the Philips works shows that similar results are obtained, but with greater accuracy and ease, by the new nomogram. The use of the nomogram is shown by a fully calculated example, and special capacitors for use with welding transformers manufactured by a Czech firm are described and illustrated. A second example taken from practice gives details of the performance of a welding transformer with capacitive compensation at various percentage loadings.—" Power Factor Improvement by a Capacitor, especially for Welding Transformers," F. Čerovsky, *Elektrotechnicky Obzor*, Vol. 40, No. 11–14, pp. 249–253, 21st November, 1951, in Czech.

Cable Testing in Production

A special development of test methods used during cable manufacture (wet and dry tests) is particularly suitable for cables insulated with p.v.c. and other plastic substances. The employment of a.c. at commercial frequency is unsatisfactory mainly because cavities or tears lead to punctures and thus to total destruction of the insulation. Therefore h.f. methods were tried instead of l.v. tests and the result was satisfactory not only because of the far greater sensitivity achieved, but also because breakdown of the dielectric did not occur, but only a surface discharge at the point of a fault in the dielectric.

The character of this discharge varies with the type of the fault; even an undue surface roughness will cause it. Another advantage is that the test voltage may be lower, which further enhances the non-destructive character of the test. Impurities in the insulating mixture and also an eccentric position of the conductor inside the insulating covering are easily discovered. The speed at which the cable tested is drawn over the testing electrode may be considerably higher than in tests at l.f. Also h.f. methods do not involve danger to the operators and they lend themselves to fully-automatic operation, so tending to increase the production rate.—" A Method of Testing and Measuring Insulation Resistance of Cables during Production," W. Duenbostel, *Bulletin* Ass. Suisse Electriciens, Vol. 43, No. 2, pp. 35–36, 26th January, 1952, in German.

Single-Core Cable Losses

The three conductors of a three-core cable in a common lead sheath produce fluxes whose effects on the lead sheath compensate mutually, but the case differs where single-core cables with separate lead sheaths are used. Accordingly the losses in three-core cables are practically reduced to the copper losses in the conductors (which also holds for armoured cables, because the eddy current and hysteresis losses in the iron armouring are also negligible) whereas single-core cables are affected by all these losses caused by the voltages induced in the metal sheaths.

Obviously the magnitude of the losses depends above all on self and mutual inductance of the three conductors and their sheaths: in other words, mainly on the geometrical configuration of the cables and their mutual position. The cables may be arranged either in a plane (" sheet ") or in

an equilateral triangle and the principle of the mathematical procedure is simply to regard the copper and the lead of each cable as the primary and secondary circuits of an iron-less transformer.

The author shows the working *in extenso* for the following cases: (a) cables in a plane: (1) lead sheaths insulated from each other; (2) sheaths earthed at one end; (3) sheaths earthed at both ends. (b) triangular cable arrangement (same three variants as under (a)). Numerical examples are given for each case and it is shown that differences between results of calculation and measurements are negligible.—" Power Losses in Buried Single-core Cables of Three-phase Systems," P. Bernard, *Bulletin Ass. Suisse des Electriciens*, Vol. 42, No. 24, pp. 954–966, 1st December, 1951, in French.

Impulse Generators

The main objects in the design of impulse voltage generators are to ensure that the voltage surge produced corresponds to a certain standard wave form and is of controllable peak value, front and back steepness (or, what amounts to the same thing, duration of front and back part of the wave) and also to obtain the optimum efficiency (or economic utilization factor) of the generator. The working principle is in most cases the gradual charging of a capacitor arrangement in parallel which, for the discharge through a spark gap and resistance, is then connected in series. This is done by means of a great number of auxiliary, fixed and variable, resistances and spark gaps. Also, the series capacitors producing the actual impulse wave are actually different ones from the charging capacitors and are themselves charged by the " charging capacitors in series," but this does not affect the principle of operation.

The principle described is known as that of the Marx generator and most of the modern impulse generators are basically only modifications of this type. The authors present a full analytical treatment of the fundamental design problems, particularly the calculation of all the circuit parameters as functions of the required wave form and amplitudes, or, more accurately, of the full range of waves required or desirable. Further important details treated are the calculation of the damping resistance and consideration of the influence of stray capacitances and inductances of the set-up. The determination of the latter by measurement and calculation (combined), one of the most difficult problems of impulse generator design, is outside the scope of the article and is therefore only briefly outlined.—" Impulse Voltage Generators," B. Heller and A. Veverka, *Elektrotechnicky Cõzor*, Vol. 40, No. 11–14, pp. 200–209, 21st November, 1952, in Czech.

Glass Insulation

Fabrics are made from special glass fused at 1,300 deg C and drawn into threads of 5, 7 or 9 μm gauge. They are usually impregnated with phenolic or silicone varnishes and the natural brittleness of the threads is partly compensated for by weaving the fabrics biased. Their insulating properties are excellent, especially when used on enamelled wire, but even more important is their resistance to chemical or other corroding influences and high temperatures and the fact that they cannot absorb any moisture. The thermal conductivity of the fabrics is high, so that a great improvement in the cooling characteristics of windings is obtained.

The useful collection of data and graphs of comparative characteristics given by the authors is a striking demonstration of the superiority of glass fabrics over other modern insulating materials, at least for many important uses in the electrical industry. Even more useful in this respect are the sections of the article in which overall calculations of the increased service life of machinery insulated in this up-to-date fashion are made. Concrete examples are given, with test and operational results. Most data are taken from American sources and refer to silicone varnish-insulated glass fabrics. The authors then formulate some rules for the preferred uses of glass fabrics, especially where they enable class A insulation to be replaced by class B, or where the American class " H " (up to 180 deg C hot point temperatures) is required.—" Modern Insulating Materials and the Possible Uses of Glass Fabrics," J. Duflos and P. Mathivet, *Revue Générale de l'Electricité*, Vol. 61, No. 1, pp. 20–26, January, 1952, in French.

[Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at the current rates.—*Editors, Electrical Review.*]

King's College, Newcastle

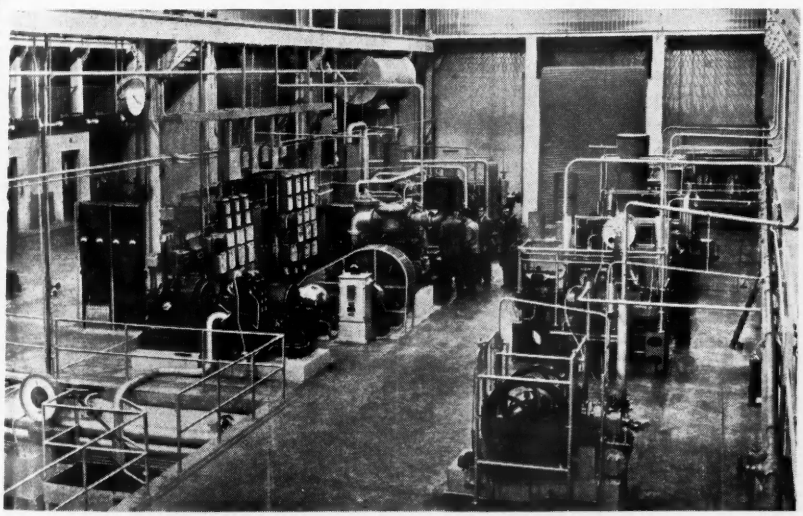
Electrical Facilities at the New Stephenson Building

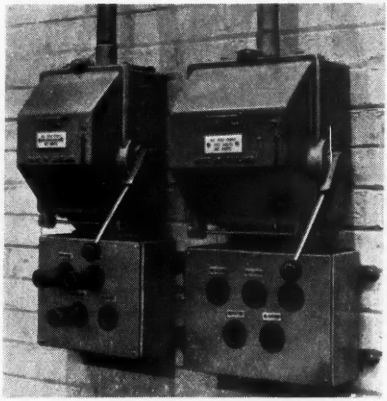
THOUGH not utilized for instruction in electrical engineering, the new Stephenson Building recently opened at King's College, Newcastle-upon-Tyne, as a branch of Durham University, is provided with a number of special electrical facilities. The building, named after the inventor of the steam locomotive who lived for a time in the neighbourhood, is occupied by the Departments of Mechanical and Marine Engineering, Agricultural Engineering, and Mathematics. Most of the ground floor of the five-storey building is taken up by laboratories and workshops, the top storey accommodating a large drawing office. Lecture rooms, a reading room, class and study rooms are situated on the remaining floors.

The most noteworthy of the special electrical arrangements is the provision of supplies both of a.c. (415/240 V) and d.c. (480/240 V) in all parts of the building on the ground floor without the need for special wiring when the service is required. This has been done by the installation of "test points" into which flexible leads of the type used for arc welding sets can be plugged at a moment's notice. These socket outlets, which were supplied by the Artic Fuse & Manufacturing Co., Ltd., and are controlled by air-break switches, are suitable for connecting motors of up to 30 h.p. Special arrangements are made in the Hydraulics Laboratory to permit the use of d.c. or a.c. motors up to 100 h.p. on two test beds where pumps, compressors and other equipment can be tested.

The greatest amount of electrical equipment is employed in the Heat Engines Laboratory, the largest department in the building. Here the steam engines and turbines are grouped round a central tiled pit so that the condensate can be conveniently measured by weighing the tanks.

Part of the Heat Engines Laboratory in the Stephenson Building





Special a.c. and d.c. socket outlets are provided to permit the immediate connection of motors, etc., without the need for special wiring

The largest machine is the sixty year old steam engine used by Professor Weighton for his historic efficiency experiments and now employed for teaching purposes. Contrasted with this is a modern steam turbine of 50 kW capacity, running at 8,000 r.p.m., recently presented to the college by the makers, C. A. Parsons & Co., Ltd.

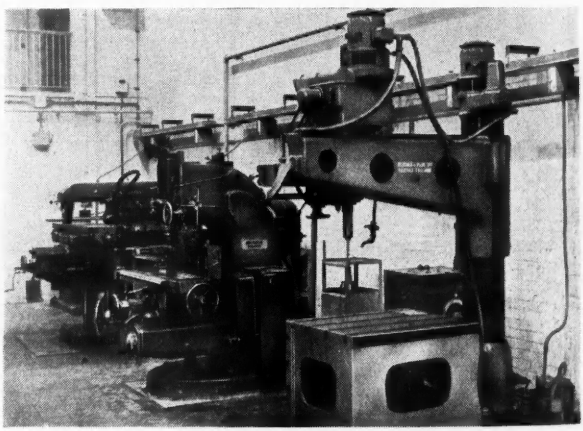
With these two large units are a Brotherhood compound reciprocating engine, another small Parsons turbine, a single cylinder steam engine and some smaller units. A Ford V8 engine, besides being used for dynamometer tests, is also available to provide emergency lighting, an automatic change-over switch being provided.

At the other end of the laboratory are a J. & E. Hall refrigeration unit (9½ h.p.) and a Belliss & Morcom compressor (100 lb/sq in) which supplies piped compressed air to other laboratories in the building. Accompanying these are a number of internal combustion engines equipped for dynamometer tests. Chloride equipment provides for battery charging via pairs of socket outlets at intervals around the walls giving either 6 or 12 V. A variety of special instruments provided includes, in addition to Farnborough engine indicators, a Southern Instruments electronic engine indicator unit, which has a camera attached to it.

An English Electric overhead busbar system feeds a collection of vertical and horizontal milling machines, a shaping machine, lathes, band saw, etc., in a workshop which is designed to serve the dual purpose of providing modern equipment for instruction and experiment in the production engineering course and at the same time the means for making special apparatus for all departments of the college. Here, as well as in other laboratories, handling of heavy equipment is facilitated by the use of Herbert Morris overhead cranes of three to five tons capacity.

Several special electrical features have been provided in the lecture theatres and a switch-panel (manufactured by Watson-Norie, Ltd.) at the lecturer's dais covers the dimming of the lights, operation of the blinds and signalling to the adjoining projection room, as well as the switching of the blackboard and dais lights.

Apart from the special purpose illumination, a good deal of attention has been paid to the general lighting arrangements, a



An overhead busbar system feeds the machinery in the workshop

A high standard of lighting has been adopted. Here can be seen the spherical fittings used in the reading room and also the electric clock and staff location unit

high level of intensity having been adopted. Generally Holophane industrial high bay fittings have been employed in the laboratories with totally enclosed G.E.C. spherical pendant units in the lecture rooms, drawing office, etc. A coloured light staff location system (Standard Telephones) has been provided throughout the building and also electric clocks (supplied by Gent & Co., Ltd., to the design of the architects).

Apart from the auxiliary supplies from the generating plant in the Heat Engines Laboratory already referred to, the main electricity supply comes from the North Eastern Electricity Board through a 1,000 kVA Parsons transformer. In a rectifier substation on the ground floor the incoming a.c. is converted to d.c. by three B.T.H. glass bulb mercury arc rectifiers with a total capacity of 250 kW. The 240 V requirements are split between the units, the 480 V supplies coming from the three units in series.

The h.v. switchgear consists of six Reyrolle type LA oil-break switches with a rupturing capacity of 150 MVA. The main switchroom for all l.v. supplies is situated above the substation and comprises an eight-panel 415 V a.c. board composed of Reyrolle type SA air-break units of 25 MVA rupturing capacity.

Reyrolle metalclad switch and fuse gear is also employed for the section boards in various parts of the building. Sub switch-fuses and distribution boards are housed in horizontal ducts which carry the rising mains at each end of the building. Pyrotenax mineral insulated cable has been employed in the workshop.

Specially designed Britmac 13 A flat three-pin surface pattern switch and socket unit

The Britmac Electrical Co., Ltd., supplied all the 5 A and 15 A switches for the lighting circuits, and also the 5 A and 15 A switch socket units to B.S. 546 for the d.c. power circuits. The switch sockets for use on a.c. are also "Britmac," and they incorporate 13 A sockets and fused plugs to B.S. 1363. Both the switch and switch socket units were produced to the requirements of the consulting engineers, and were specified to

have the cuttered type of switch holes (no rings) and corner fixing holes with " secret " pattern screws.

The architects for the building were Edwards & Mamby and the consulting engineers R. W. Gregory & Partners. The electrical installation was carried out by Watson-Norie, Ltd. We are obliged to Professor A. F. Burstall, head of the Department of Mechanical and Marine Engineering, for permission to inspect the installation.

Wind Power Generation

North Wales Site Approved

IT was announced last week that the British Electricity Authority has now received the formal consent of the Minister of Fuel and Power to the erection of a wind-driven power generator at Mynydd Anelog, Aberdaron, Caernarvonshire.

Soon after the Authority was established in 1948 it decided to associate itself directly with the research into wind generation already being carried out by the British Electrical and Allied Industries Research Association (E.R.A.) and in March, 1949, tenders were therefore invited for the design and construction of an experimental 100 kW wind generator while investigations began, in collaboration with the E.R.A., into wind conditions on the North Wales coast.

In June, 1950, a contract was placed with Enfield Cables, Ltd., for a machine to operate on a principle evolved by Monsieur J. Andreau, in which connection de Havilland Propellers, Ltd., are responsible for the aerodynamic design and performance and the English Electric Co. for the alternator and control apparatus.

The wind driven propeller of the Enfield-Andreau generator is not connected by gearing to the turbine as is usual in other windmill generators. The two aluminium alloy propeller blades, sweeping a circle of 80ft diameter, are of hollow construction with air exit ports at the tips. When the propeller rotates, air is discharged from the blade tips by centrifugal force and suction is thereby created in the 100ft high hollow tower on which the propeller is mounted. Air is drawn through apertures in the base of the tower and, in its passage up the vertical shaft of the tower, drives a turbine.

The controls of the generator are operated automatically by wind pressure on a speed-sensitive device. Electrical controls operate a valve for the indrawn air to by-pass the turbine in the support tower and thus, when this valve is open, the turbine cannot operate although the propeller is rotating. Hydraulic controls, similar to those developed for de Havilland aircraft, change the pitch of the blades of the propeller to suit various wind speeds, ensuring that the propeller turns at a constant speed of 100 r.p.m.; when winds exceed a speed of 75 miles an hour, the blades are feathered and halted.

An 8 kW model of the " Anemo " machine, as the Enfield-Andreau generator is called, has been tested in France. The 100 kW machine now being constructed for the B.E.A. will be erected temporarily on a site near St. Albans within the next few months and, after undergoing operational tests extending throughout the winter, will probably be transferred to the permanent site on Mynydd Anelog in the spring of next year.

Hydro-Electric Tunnel Completed

THE driving of the 6-mile Errochty tunnel at the North of Scotland Hydro-Electric Board's Tummel-Garry scheme was completed on 6th March when a section 1½ miles in length was joined to the surge chamber. The tunnel is the longest built by the Board. It will convey water from a new loch 1,080ft above sea level formed by a dam 1,310ft long and 127ft high to Errochty power station being built at Dalcroy, near the west end of Loch Tummel. The station's capacity of 75,000 kW will about equal the combined output of the two other stations in the scheme, Clunie and Pitlochry. At the ceremony of blasting the final barrier of rock, Mr. J. Guthrie Brown, of Sir Alex. Gibb & Partners, consulting engineers, said that 500,000 tons of rock had been excavated and 450 tons of explosives used on the tunnel during the three years since it was begun.

VIEWS on the NEWS

By REFLECTOR

As the Associated Municipal Electrical Engineers, the A.M.E.E. had a definite field of recruitment for membership. After nationalization the dividing line between "chiefs" and the lower ranks became blurred and engineers and managers were not always the same people. While retaining its initials the organization expanded its scope and became the Association of Managerial Electrical Executive. In its new guise the A.M.E.E. has come into conflict somewhat with the Electrical Power Engineers' Association. An agreement was arrived at between the two bodies but it now seems to have broken down and there have been accusations of "poaching" from both sides. It now looks as though there is going to be strenuous competition for membership among the "borderline" officials of the B.E.A. and Electricity Boards.

* * *

Glowing appreciation of the South Eastern Electricity Board was voiced at a recent meeting of the Surrey Town and Country Planning Committee. The Board was proposing to erect a short overhead line at Box Hill, a Surrey beauty spot, and although it was not compelled to do so submitted a plan to the Committee for its information before proceeding with the work. The Committee raised no objection to the line and put its appreciation of the Board's courtesy on record.

* * *

A correspondent has drawn my attention to a somewhat extraordinary form of electric lighter described in the March Newnes *Practical Mechanics*. It comprises a jar, partly filled with salt water, through the cork of which pass wires on which two brass or copper strip electrodes are suspended. A second section consists of two strips of sheet brass or copper mounted on a piece of mica or asbestos sheet. The two parts are housed in a wooden box and connected in series to the mains. A metal striker, with an insulated handle and packed with cotton wool, is dipped into a bottle of spirit and when it is drawn across the edges of the sheet brass a spark results which ignites the cotton wool. I hope that few readers of the paper will be induced to construct this lethal device, even if they take care (as instructed) not to put too much salt into the water in the jar as it will "blow the fuses."

* * *

Peculiar ideas regarding the abilities and limitations of electrical equipment are resulting from the not-always-disinterested publicity given to power cuts. The *South Wales Argus* reports that the Bedwas and Machen Housing Committee fears that because only electric cookers are to be put into new houses on the Chatham, Machen, site "workers may sometimes have to go to work without a hot meal or drink." When, however, the Council was told that the alteration of arrangements to allow for the installation of solid fuel burning appliances would lead to an extra cost of £100 per house it decided to let the original plan proceed. Nevertheless it proposes to send a deputation to the South Wales Electricity Board with a view to ensuring a constant supply of electricity. The Board could reasonably reply that the workers need not fear cuts before 8 a.m. by which time they should have had their breakfast.

* * *

It is reported from New York that a summons has been issued against his landlord by an electrical engineer for neglecting to maintain the temperature of the tenant's apartment. The landlord cannot plead that he has not been warned for the engineer fitted up a gramophone and arranged that it was switched on by a thermostat when the temperature fell to below 65 deg F. He had made a record which warned the landlord that under the New York Sanitary Code he was liable to a heavy penalty if he did not ensure that the temperature of the apartment was maintained at or above 65 deg. Apparently this had no effect.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AMONG those who received awards from the Duke of Gloucester at the investiture on 12th March at Buckingham Palace was **Mr. W. Davies,** radio officer No. 1 in the records of the Marconi International Marine Communication Co., Ltd. He was awarded the M.B.E. in the last Honours List for his services to marine radio. Mr. Davies was the world's first official seagoing wireless operator, as they were then called, and is still serving at sea. He completes his fiftieth year in the service of the Marconi Marine Company this summer.

A silver tea service was presented by his friends to **Mr. Frank Cooke** at the Great Northern Hotel, Dewsbury, on 3rd March, on his retirement as chief control engineer of the Thornhill control room of the Yorkshire Electricity Board. Mr. Cooke, who joined the staff of the Yorkshire Electric Power Co. in 1918, became senior control engineer two years later. He held this position until vesting date when he became chief control engineer of the Thornhill system control room of the Board. Mr. H. Lloyd, the Board's operation engineer, in making the presentation, said that under Mr. Cooke's direction the control room, which originally controlled some 110 substations, grew until it was looking after some 3,000 substations. Mr. Cooke has retired to Skelmanthorpe.

Mr. F. Cooke

Mr. F. J. Lane, O.B.E., M.Sc., M.I.E.E., transmission design engineer to the British Electricity Authority, flew to Portugal on 15th March to lecture in Lisbon and Oporto under the auspices of the British Council and the Ordem dos Engenheiros. His subjects were " New trends in the application of protective gear on electrical equipment " and " High-voltage transmission lines." He will be away until 23rd March.

Mr. A. S. Shier, a director of Thorn Electrical Industries, Ltd., and a director of its subsidiary Thorn Electrical Industries (South Africa), Ltd., left last week for an extensive tour of South Africa and the Rhodesias, during which he will visit the lamp factory at Johannesburg of African Lamps (Pty.), Ltd., in which Thorn Electrical Industries have a controlling interest.

Mr. P. C. Boon has been appointed a director of Hoover (Australia) Pty., Ltd., Sydney, N.S.W. He joined the Australian Hoover organization in January 1950 as sales manager and is now sales director. He started with Hoover, Ltd., in England as a representative in the Kingston district in 1946 and subsequently became district manager at Westminister and manager of the Northern branch at Manchester.

Mr. Karl Seheult, distribution superintendent with the Trinidad and Tobago Electricity Commission, is making his first visit to the United Kingdom for his long leave, arriving in the middle of June. His address will be c/o Barclays Bank (D. C. & O.), 29, Gracechurch Street, London, E.C.3.

Mr. E. Belcher has been appointed director and sales manager of the Ransome & Marles Bearing Co., Ltd., and **Mr. J. B. Samson,** M.I.Mech.E., M.I.Prod.E., has been appointed a director and works manager.

Bill Switchgear, Ltd., announce that following the recent resignation of Mr. C. Baker, chief sales engineer for the Midland Area, the following arrangements for sales representation have been made :—**Mr. G. H. Garbett,** previously North Midland Counties representative for the company, has now been appointed sales engineer for the Midland Area, embodying the counties of Warwickshire, Northamptonshire, Huntingdonshire, Bedfordshire, Oxfordshire and Buckinghamshire. **Mr. C. G. Bachelor,** previously responsible for the South Midlands and South Wales, will

Mr. G. H. Garbett

Mr. C. G. Bachelor

now undertake the duties of sales representative for Shropshire, Staffordshire and Leicestershire.

Mr. **F. Winder**, M.I.E.E., has been appointed district manager, Hendon, Northmet Sub-Area, of the Eastern Electricity Board in succession to **Mr. G. C. Chamberlain** who is retiring on 15th April. Mr. Winder was educated at Kings School, Canterbury. He saw service with the Royal Flying Corps at home and overseas during the 1914-18 war and subsequently received his electrical engineering training at Faraday House Engineering College. Mr. Winder commenced his career with W. T. Henley's Telegraph Works Co., Ltd., in 1923 and joined the Northmet Power Co. in 1925 as assistant engineer, Chingford. He was subsequently appointed sales engineer, Hertford District, in 1931, became district superintendent in 1938 and district manager in 1948.

Mr. R. F. Winder

Mr. T. A. G. Madden, B.Sc.Tech., A.M.C.T., A.M.I.Mech.E., A.M.I.E.E., has been appointed engineer in charge of the Co-ordinating Sub-Branch of the Generation Construction Sub-Department at British Electricity Authority Headquarters in succession to **Mr. E. S. Booth**. Since June, 1948, Mr. Madden has been construction engineer at the headquarters of the Merseyside and North Wales Division. Before that he was with the Liverpool Corporation Electric Supply Department following service with Norwich Corporation Electricity Department and International Combustion, Ltd., at Derby.

Mr. R. H. Widdowson is resigning his position of general manager with Herman Smith, Ltd., Reliance Works, Dudley, as from 31st March to take up the position of director and general manager of Geo. Mathews & Co. (Cradley), Ltd.

Mr. H. Perkins, East Coast electrical representative of Falk, Stadelmann & Co., Ltd., is retiring for health reasons after thirty-eight years' service with the company. The directors are giving a dinner in his honour on 27th March at the Constitutional Club, London.

Mr. A. E. J. Walker, A.M.I.E.E., has been appointed sales manager with Newey & Eyre, Ltd., Birmingham area. He resigned his position as manager of the Birmingham branch of Siemens Electric Lamps & Supplies, Ltd., after sixteen years with the company during which period he represented them in the London area, Northern Counties and Scotland, and was a departmental manager at the Woolwich works and London office. He was with Metropolitan-Vickers, Trafford Park, from 1928 to 1935 engaged on switchgear design.

Mr. J. E. Bellis, a director of Bellis & Morcom, Ltd., has been appointed managing director as from 1st April next.

By invitation of the Australian branches of the Institute of Transport, the president of the Institute, **Mr. A. B. B. Valentine**, and **Mr. F. W. Crews**, the secretary, are leaving London on 22nd March to visit Australia, where they will be given opportunities of seeing something of the transport organization in New South Wales and Victoria and of meeting the members of the New South Wales and Victorian branches. They are due back in London on 4th May.

Mr. T. Garrett, a centre-lathe turner with Lancashire Dynamo & Crypto (Mfg.), Ltd., has completed fifty years' service and was recently presented with a cheque for £50 by Mr. S. Storey, M.P. for Stretford, at a ceremony held at the company's Trafford Park Works. Mr. A. W. A. Dick-Cleland, joint managing director of L.D.C. (Mfg.), Ltd., addressed a gathering of 1,300. At this same ceremony Mr. Storey also presented gold watches to six employees who had completed twenty-five years' service, bringing the total number of these presentations at Trafford Park to 242. He also handed ex-gratia retirement cheques to six other employees all over seventy years of age.

Mr. H. F. Bibby, B.Sc.Tech., A.M.I.E.E., A.M.I.Mech.E., was appointed on 1st January last, manager of the American Division of the Metropolitan-Vickers Electrical Export Co., Ltd., in London. Mr. Bibby, who was previously manager at The Hague, joined Metrovick in 1929 for the first year of a probationary college apprenticeship course, returning to complete the course four years later and then joining the staff of the Motor Engineering Department. In 1939 he transferred to the M-V Export Co. and went to The Hague as liaison engineer with the company's former agents in Holland, from which country he escaped to England with his wife three days after the invasion in May, 1940. During the war he was engaged on development work in the Motor Engineering Department.

Mr. H. F. Bibby

In 1945 Mr. Bibby rejoined the Export Co., and in the following year returned to Holland

to open its new office at The Hague. During 1951 he spent several months in South America.

To commemorate the completion of twenty-five years' service by **Mr. W. Boyd,** director of Edward Holme & Co. (1931), Ltd., a whist drive and dance was held on 10th March at Bowdon Assembly Rooms, Altrincham, during which the staff and employees of the company presented Mr. Boyd with an inscribed silver salver and cut glass decanter. Among those who attended the function was Mr. R. H. Fawcett, managing director.

The **B.T.H. (Willesden) Long Service Association** welcomed twenty-four new members each with twenty-five years' service at the annual reunion at Wembley Town Hall on 13th March. Mr. E. Alexander, chairman, introduced Mr. E. S. Little (secretary and comptroller of the company) who presented certificates. Mr. Little presented also the directors' gift of a television receiver to Mr. William Wilcox, who had that day completed fifty years with the company—the first Willesden employee to do so.

The annual dinner of the **Essex Electricity Supply Sports and Social Club** (Eastern Electricity Board), Romford District, was held at the White Hart Hotel, Romford, on 7th March, some 125 members, friends, and a number of representatives of manufacturing concerns attending. The chairman was Mr. R. A. Archer, district commercial engineer, Romford, and Mrs. Archer was also present. The toast of the Eastern Electricity Board, Essex Sub-Area, was proposed by Mr. R. W. J. Benyon, district manager, Romford, who spoke of the great progress made in the Essex Sub-Area despite the restrictions, and also of the co-operation and team-work between staff and management. Mr. W. E. Wardrop, commercial officer, Essex Sub-Area, responded. Mrs. R. H. M. Barkham proposed the toast to the Club, in place of her husband, Mr. R. H. M. Barkham, who was indisposed, and Mr. [illegible] A. Lambert replied. The toast to the visitors and guests was given by Mr. L. F. Fitch, construction engineer, Romford District, and Mr. K. Foulds, Jackson Electric Stove Co., Ltd., responded. After the dinner there was dancing.

"Black Chiffon," a play by Leslie Storm, was the choice of the **G.E.C. Dramatic Society** for its latest production, presented at the Fortune Theatre, London, W.C.2, last week. This does not depend for success on its plot; it is a psychopathic study of the behaviour of a middle-class housewife, about to lose an adored son in marriage, who is detected in a theft from a shop. Thus it is not the easiest of plays for amateurs. The G.E.C. players were fortunate in having Betty Michell in the part of Alicia Christie (the housewife). Her performance was excellent and so was that of Dudley Binnington as the doctor, Bennett Hawkins. The rest of the cast, with much less to do, acquitted themselves well—John Lisle as the son, Sheila Robinson, his fiancée, Pauline Noelles, his sister, Bernard Bettridge, his father, and Sybil Thompson as "Nanny." The production was again by William Peacock.

The representatives of the United States electricity supply industry, who are on a visit to this country under the auspices of the Anglo-American Council on Productivity, recently paid a two-day visit to Yorkshire during which they were conducted around by members of the **Yorkshire Electricity Board** area headquarters and Divisional staffs. The accompanying picture shows Mr. D. Bellamy, chairman of the Yorkshire Board, with a group of visitors and officers of the Board and Division outside the Scarcroft headquarters of the Board.

Mr. D. Bellamy in centre of a group of American visitors and officers of the Y.E.B. and Division at the Scarcroft headquarters of the Board

Hoover, Ltd., announces the following appointments: **Mr. G. J. Hemmings,** field sales manager (home), to be Continental sales manager; **Mr. W. M. Tribute,** assistant advertising and publicity manager, to be export advertising manager; and **Mr. H. K. Squires,** assistant advertising and publicity manager, to be home advertising manager.

The first annual dinner and social evening of the Scarborough Branch of the **Electrical Contractors' Association** was held at the Royal Hotel, Scarborough, on 14th March. The branch chairman, Mr. J. G. Appleyard (who was accompanied by Mrs. Appleyard), presided, and the company included Mr. and Mrs. A. S. Redvers-Pratt, Mr. and Mrs. T. A. Garness and Mr. C. Hawson (branch secretary) and Mrs. Hawson.

Ferrous Castings, Ltd., Warrington, at a social evening held on 7th March, presented long service awards to fifteen employees who had completed twenty-five or more years' service.

Some 400 members and friends of **Johnson & Phillips, Ltd.,** were present at Greenwich Town Hall on 14th March to witness the formal presentation of awards to the company's outstanding students of the year. This was the first function of its kind, and, as Mr. G. L. Wates, J.P., chairman of J. & P., said in his opening speech, it was an occasion which enabled the apprentices, their parents and friends to learn something of the company's activities. There was a display of models and other examples of home handicraft for the visitors to inspect. The company included several principals of local polytechnics and technical colleges, members of the Telcon Education Committee and representatives of the company's board and management. As a token of their appreciation for what the company was doing for their technical education, the apprentices presented Mr. Wates with a landscape oil-painting.

OBITUARY

Mr. J. Banks.—The death has occurred of Mr. John Banks, M.I.E.E., founder of the Craven & District Electrical Construction Co., Ltd., Skipton. Mr. Banks designed and erected overhead and underground distribution schemes in various parts of the country and Ireland, and his work included the overhead line providing a supply to Skipton, and the electrification of Kettlewell, one of the first villages in Craven to have its own lighting scheme.

Mr. A. McCabe.—The death is announced of Mr. Anthony McCabe, a "Creda" sales representative at the Newcastle branch of Simplex Electric Co., Ltd. Mr. McCabe, who was forty-two years of age, died after a short illness in the West Hartlepool General Hospital. He had been with Simplex for some fourteen years.

Mr. W. H. Pilmour, managing director of Parsons Marine Steam Turbine Co., Ltd., Wallsend, has died suddenly in his office at the age of seventy-five. He joined Parsons fifty-four years ago, and was closely associated with Sir Charles Parsons in the development of the turbine. He became managing director of the company in 1936.

Major Stanley Melbourne Mohr, O.B.E., M.C., M.I.E.E., managing director of the Micanite & Insulators Co., Ltd., who died on 10th March at the age of sixty-six, received his technical education at the Finsbury Technical College, London, and in 1903 joined the British Westinghouse Electric & Manufacturing Co., Ltd., Trafford Park, Manchester, serving three years as a college apprentice. In 1906 he went to Russia where he occupied the position first of senior erection engineer and later general manager in Russia for the British Westinghouse Co. He returned home in 1914 to join the Army and served with the Sherwood Foresters from 1914 to 1920 in France, Belgium and Russia, being awarded the O.B.E. (Military) and Military Cross, was twice mentioned in despatches and retired with the rank of major. In 1920 he joined the Micanite & Insulators Co., Ltd., first as sales manager, later becoming sales director, and was appointed managing director in 1930. He was also managing director of British Tego Gluefilm, Ltd., and chairman of Oiled Silk Industries, Ltd., and in addition, a director of Associated Insulation Products, Ltd., and J. Burns, Ltd. Major Mohr was a member of the B.E.A.M.A. Council from 1944 onwards; he was chairman of the British Plastics Federation from 1939 to 1944 and was president of the Plastics Institute for the session 1945-46.

The late Major S. M. Mohr

WILLS

Mr. C. P. Newman, a director of S. Smith & Sons (England), Ltd., who died on 16th October, left £10,109 gross (£2,248 net).

Mr. H. B. Prentice, founder and managing director of Prentice, Ltd., who died on 9th July, left £65,868 gross (£65,561 net).

Mr. R. McKenzie, sales director of James McKenzie, Ltd., electrical engineers, of Birkenhead, who died on 19th September last, left £5,559 gross (£5,292 net).

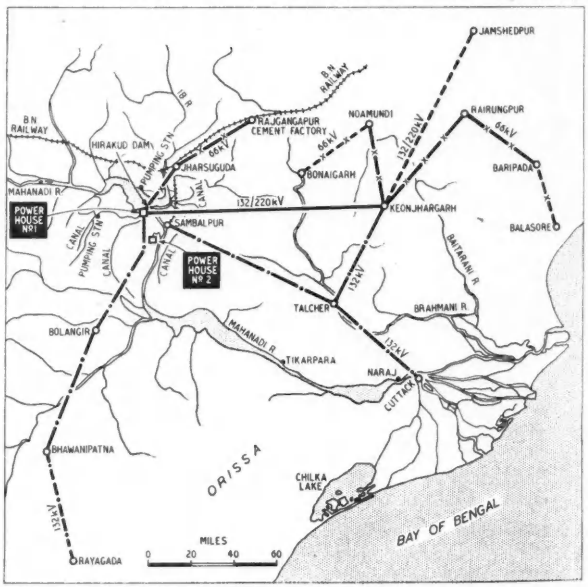
Mahanadi Valley Scheme

Irrigation and Power Development in Orissa

TWO large irrigation and hydro-electric power schemes are being undertaken in Orissa, India—the Machkund project in the south and the Hirakud Dam development farther north. The latter is part of an ambitious plan for exploiting the resources of the Mahanadi valley, where rich deposits of coal, iron, bauxite, manganese, graphite, chromite, mica and other minerals are said to exist. A large tract of land will be irrigated and the delta freed from floods.

There are three possible sites in the valley capable of independent development, at Hirakud, Tikarpara and Naraj. Between them they could make available 4 million kW of power, irrigate 20 million acres of land and provide a 380-mile navigable waterway from Madhya Pradesh to the Bay of Bengal. The Central Waterways, Irrigation and Navigation Commission recommended that the Hirakud project should be undertaken first, being simpler in physical features, design and construction and capable of yielding quicker results.

Recently some changes have been made in the construction programme at Hirakud which has now been divided into three parts, the first to be completed by 1955–56. This initial stage includes the construction of the main dam and four power units, making available 50,000 kW, irrigating 1·35 million acres of land and providing flood control. This stage is expected to cost £45 million. In the second stage (to be ready by 1960–61) the dam will be completed, the acreage under irrigation raised to 1·93 million and the power capacity increased to 85,000 kW. The final stage will bring the power plant up to 200,000 kW. Previously emphasis had been placed on the lower or subsidiary dam. Power would have been available in 1953–54 but virtually no irrigation, whereas in the revised scheme the availability of power will be delayed by some two years but flood control and irrigation will be afforded sooner. Up to the present approximately £7·5 million has been spent on the project. The first batch of concrete was laid by the Prime Minister, Mr. Nehru, in April, 1948.



Map of the Mahanadi Valley showing sites of power houses and routes of transmission lines

Proposed

123/220 kV
132 kV
66 kV

Future

132/220 kV
132 kV
66 kV

The main dam is sited below the confluence of the Ib River and about nine miles upstream from Sambalpur. Some 3,700 ft. of it will be in concrete and the remainder earth, the maximum height above the deepest part of the river being 180 ft.

There are to be two power houses, one at the main dam and the other at a subsidiary dam at the tail of a 14-mile canal. They will be interconnected by a double circuit 132 kV line and other transmission lines will radiate to various load centres. Eventually the transmission system will be linked with that of the Damodar Valley Corporation on one side and with the Machkund hydro-electric project on the other.

PARLIAMENTARY NEWS

From Our Special Reporter

IN the House of Commons last week Mr. Ballard (Conservative) moved the second reading of the Heating Appliances (Fireguards) Bill, the purpose of which, he explained, was to prevent the sale in shops of electric and gas fires and of oil stoves unless they were fitted with an adequate fireguard. He said that last year about 700 people died from burning accidents in England and Wales, and about 100 in Scotland. A new situation had been created by the vast development of electric and gas fires, many of which were portable. It was possible to fit to these fires a light steel wire mesh guard which protected clothing from touching the element, and could be so arranged that children could not put their fingers through it to touch the element or the flame. The proportion of gas and electric fires fitted with guards was steadily rising and the British Standards Institution had issued a set of standards for such guards. The reduction in burning accidents would fully justify the small addition to cost, the extra amount of metal used and the small reduction of efficiency.

The Bill would empower the Home Secretary and the Secretary of State for Scotland to make regulations laying down standards of construction and fitting of guards for electric and gas fires and oil stoves. After some date to be fixed it would become an offence to sell any of the heating appliances covered by the regulations unless they were adequately guarded according to the standards laid down. The Bill was intended to apply at the point of sale.

Mr. Nabarro (Conservative), seconding, said that the estimated output in 1953 of electric and gas fires was 610,000 and about 120 tons of metal would be required to provide the necessary guards.

Mr. Woodburn (Labour), supporting, said that perhaps the Bill did not go far enough. Manufacturers should have to certify that fires for sale had been passed by the appropriate authorities as being free from danger or risk.

In the debate which followed, some members were critical of the element of compulsion in the Bill, urging that the matter should be left to the common-sense of the public.

Sir Hugh Lucas-Tooth, Under-Secretary, Home Office, said that the Inter-Departmental Committee set up in 1947 had welcomed the Bill, in which some of the Committee's recommendations were incorporated. If the Bill became law the Home Secretary would be willing to make regulations and would consult the British Electricity Authority and the Gas Council before such regulations were made. This was a sensible and proper measure and the Government would do everything to make it effective.

The Bill was read a second time.

Electricity Price Increases

Captain Pilkington asked the President of the Board of Trade whether he had made any estimate of the extra expense which would be caused to industry in the area affected through the higher tariffs proposed by the Southern Electricity Board, due in part to reduced consumption by consumers.

Mr. Peter Thorneycroft said he had no information which would enable an estimate to be given of what additional charges might have to be borne by a wide variety of industry as a result of increased tariffs.

Captain Pilkington asked if, as these higher tariffs were most burdensome to industry and also to the home, there was any possibility of de-nationalization, or whether the harm had already been done.

There was no reply.

Steel Allocations

Mr. John Hall asked the Minister of Supply if he was aware that manufacturers after having their allocation of tinplate and steel cut were having difficulty in receiving the full amended allocation from the producers; and what steps he was taking to improve the position.

Mr. Sandys said he was aware of the difficulties which, in the case of tinplate, were due to

unforeseen delays in bringing new plant into production. The industry was making every effort to increase supplies.

Power Stations and Defence

The Minister of Fuel and Power told Mr. Nabarro that he would take steps to secure the strategical deployment for defence purposes of all new power stations projected by the British Electricity Authority.

New Marchwood Station

Mr. Lloyd informed Mr. Morley that the erection of the new electricity generating station at Marchwood, near Southampton, would be started about 1st July.

Hydro-Electric Research in Scotland

In the House of Lords Lord Sempill asked the Government whether it was the intention of the North of Scotland Hydro-Electric Board to close its research organization for investigating the application of electric power to the processing of minerals and other raw materials in its area, bearing in mind the success already achieved and the need for encouraging the re-creation of the crofting industry in the Highlands by the introduction of modern techniques. He said that the provision of electric power made the working of local raw materials possible for the first time, not only for local use but as a substitute for similar materials imported. There had been some progress as, for example, in the diatomite field in Skye. For this the Hydro-Electric Board was to be congratulated. It would be most unfortunate if this promising beginning, which cost some £3,000 a year and was but one line of a general research undertaken by the Board, were abandoned.

The Earl of Home, Minister of State for Scotland, said he felt that Lord Sempill's apprehension had arisen because the Hydro-Electric Board had recently ended a three-year contract which it had with one individual. That did not by any means imply that it intended to put an end to the research work it was doing. That work came under two heads. The Board had its own laboratory at Dunipace, where it was doing a wide variety of research work. Among the subjects was the possibility of de-watering peat and diatomite; the Board was experimenting with an electric counter to count salmon as they went up a fish pass, with the drying of hay, and the firing of a gas turbine by peat fuel on a larger scale than hitherto.

In addition, the various universities were doing research for them, namely, Aberdeen, St. Andrews, Glasgow and elsewhere. They were doing experiments into the discharge of water into rivers, stress distribution in dam structures, and matters of that kind. The Hydro-Electric Board was in the closest touch with the Scottish Council (Development and Industry) and with Lord Bilsland. He would have talks with Lord Bilsland about the matters Lord Sempill had raised, and in particular about the possibility of a mineral research station.

Lightweight "District" Train

THE first lightweight railway cars built for use in this country went into service last week on London Transport's District Line. Four of them are operating in conjunction with two steel driving cars in a six-car unit. The new cars have bodies of aluminium alloy of the aluminium-magnesium-silicon type, and form part of an order for ninety, the largest application of aluminium, so far, in the British rolling stock industry. In profile and general finish they are similar to the "R"-type steel cars, but the opportunity has been taken to restyle and reposition the fluorescent lighting fittings to give better diffusion of light. In addition, the roofs of the aluminium cars have been left unpainted. The weight of each car is 26·65 tons which compares with the 33·2 tons of a steel car. The cars are being built by the Metropolitan-Cammell Carriage & Wagon Co., Ltd., which collaborated with the Metals Division of Imperial Chemical Industries in the design.

Interior of aluminium alloy car

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Bedroom Heating

I HAVE so far refrained from taking part in the controversy initiated by Mr. A. C. Johnson in his article in your issue of 25th January, but now his specific statement in your 7th March issue to the effect that the oil filled radiator is the only safe electric space heater really warrants some rejoinder.

First, from the safety angle, there are at least three makes of convector on the market which are as safe as any oil-filled radiator, even to the extent of "posting" pieces of paper through the grilles, or emptying water over them, and one of these makes was available for many years before oil filled types were ever introduced to this country.

Secondly, on the score of efficiency or effective use, one oil filled type is in my opinion rather useless for bedroom heating in that it operates more like a low temperature panel heater and to feel any real effect from it, even after two hours on circuit, it is necessary to stand in front of it and treat it as a radiator. I recently carried out some temperature tests in a bedroom during a cold spell. The bedroom was 17ft by 13ft by 8ft 6in, just under 2,000 cu ft; outside temperature averaged 33 deg F.

On the first two evenings a 1 kW oil filled radiator was used and a thermograph was placed at a height of 4ft 6in in the centre of the room and about 6ft from the heater. On the first evening, after two hours from switching on, a temperature rise of 3 deg F (42 to 45 deg) was indicated, and on the second evening 3·5 deg F (42·5 to 46 deg).

On the following two evenings a 1 kW convector was used and the respective temperature rise in one hour was 6 deg F (43 to 49 deg) and 5·5 deg F (42 to 47·5 deg) and one really felt comfortable in any part of the room.

Thirdly, how much more effective is the oil filled type as a thermal storage heater (presumably what Mr. Johnson means when he writes about its "heat carry over")? There is possibly a little in it, but very little (assuming one forgets the time lag in heating up) and certainly nothing like a one-hour carry over, which is the usual figure quoted.

Some tests indicated that an oil filled radiator switched off with its surface temperature at 76 deg C cooled down to 45 deg C in 15 minutes, to 19 deg C in 30 minutes and to nearly ambient (16 deg C) in 50 minutes. Therefore the total heat output over the 50 minutes was extremely small.

Oil-filled radiators, like all other types of heaters, have their uses, but personally I think it is going the long way round to use an immersion element to heat oil that in turn warms a pressed steel or c.i. case, which finally transmits its heat to the air surrounding it. Surely something which provides full heat output in a few minutes from switching on and circulates its output quickly throughout the space being heated is essential, especially for bedroom heating.

Welwyn Garden City. C. B. CLELAND.

Space Heating Radiators

MY experience concerning the water filled electric radiator confirms in general the views of Mr. J. C. Sanders; for, over a period of several years when a radiator of this type was in normal, intermittent service and deliberately neglected, no trouble whatever was experienced. Even the rate of water evaporation was negligible. It happens that this particular radiator was not made in South Wales, but it is of British manufacture.

The completely sealed liquid-filled radiator has, even if only from a commercial standpoint, a very definite attraction; but, on the other hand, it is honestly difficult to better the virtues of water from the points of view, taken collectively, of specific heat value, circulation by convection and economy.

Nevertheless, during recent years, a radiator was developed with a view to avoiding the use of liquids, and avoiding, too, the usual container structure of welded ferrous metal pressings. Basically, it consisted of an orthodox heating element housed in an extruded or cast body of

solid aluminium whose surface might be left in its virgin state or desirably treated by well-known anodizing and colouring processes. The high value of specific heat of the aluminium, though much inferior to the corresponding values of the liquids, coupled with the good conductivity, quite apart from its other properties, made possible an extremely robust and virtually indestructible radiator permitting of short-term thermal-storage capacity or carry-over.

However, regardless of whether these radiators utilize water, oil, some kind of liquid, solid metal, or even a block of refractory material or a refractory powder filling, it seems certain that their use can achieve some measure of load alleviation, if logically time-switched or manually controlled, by snipping the peaks so often aggravated further by cooking demands.

*London, S.W.*1. S. H. PARSONAGE.

"Nationalized Inertia"

YOUR anonymous contributor (14th March issue) may be shocked to know that in this farming district we could not move the late owners of the electricity supply undertaking to do a thing for the farmers in need of electricity, and that within a few months of vesting date every applicant was equipped by the Eastern Electricity Board after years of waiting.

Whatever other nationalized industries may be like, your contributor should be better informed on the energetic activities, at least in this area, in spite of all the committees, and the supposed delays and inertia which are only to be expected in such a huge undertaking still "cutting its teeth."

I have no political ideas on this subject, but I can say that if private enterprise were still to be our local authority, we should still be waiting for reasonable attention. I might add that the speed of attention to our requirements leaves us breathless.

We ordered an electric stove and a washing machine two years ago. The former arrived and was installed in four hours, while the latter came the following morning. We have never yet had such courtesy and friendly association with the various officials. Do not get me wrong; I am a Conservative, but I say: "Nice work, B.E.A."

Goldhanger, Essex. FRANCIS H. PAGE.

Domestic Appliances Defended

A STRONG defence of the use of electrical appliances was made by Lord Citrine, chairman of the British Electricity Authority, last Friday at the Electrical Contractors' Association Birmingham Branch ladies' night. He said that one would assume from some of the criticisms received that the electrical industry was becoming almost an anti-economic and anti-social force. It was so upbraided for permitting the use of electric fires and other devices that one almost hesitated to say anything in extenuation of the industry, much less to extol its virtues.

He believed we were dealing with a force which could provide humanity, in the easiest way, with all the adjuncts of a happy and beneficial life in the community. It would be a retrograde step to curtail the use of electricity. We had it dinned into us that the difference in the productivity of the U.S.A. and this country was due to the greater use of electricity there. Surely we were entitled to employ this agency of electricity in the home and it was a paramount common interest to expand the use of electricity to enable man to obtain a fuller and happier life. On the electrical industry depended the prosperity not only of those engaged in the industry itself but also of the country as a whole.

Speaking of the functions of the Association, Lord Citrine declared that good faith was essential if stable labour relations were to be achieved. Though himself a former Electrical Trades Union official he made no apology for saying that he believed in as good organization on the side of employers as on the side of the work-people. In its director, Mr. L. C. Penwill, the Association had one of the cleverest negotiators he had met, but however good the officers were, the branches formed the background of the organization and determined whether it was a virile one or not.

The function was presided over by Mr. W. A. Gazard, branch chairman, who emphasized the importance of friendship between competitors in the same trade. On behalf of the branch Mrs. Gazard presented a silver hors d'oeuvres dish to Mr. Stanley N. Watkins, a past chairman of the branch, to mark his election as president of the E.C.A. A cut glass vase was also presented to Mrs. J. H. Boardley in token of the work done by her husband as social secretary. Alderman W. S. Lewis, chairman of the Midlands Electricity Board, represented the Lord Mayor of Birmingham.

Refrigeration Industry

Anomalous Import-Export Situation

MANY distinguished guests were among the 400 people present at the annual luncheon of the British Refrigeration Association at the Connaught Rooms, London, W.C.2, last Friday. Mr. A. R. Leach, chairman of the B.R.A., presided and the principal toast, that of the Association, was proposed by Sir Harold Webbe, C.B.E., M.P. In his speech Sir Harold Webbe said that many people pointed the finger of scorn at trade associations but these associations were as vital to our economy as trade unions. Governments must inevitably come more and more into the conduct and administration of industry and they must therefore be able to ascertain from industries as a whole how a particular policy was going to affect those industries and what they thought about it

The B.R.A. had been wise in concentrating on quality rather than quantity in the matter of membership; it made membership a privilege and ensured that the Association was properly representative. A difficult future faced the refrigeration industry. The problem of the supply of raw materials could not be tackled by individual concerns; it was one for the Association and its officers.

B.E.A. Competition Criticized

In his view the competition of the British Electricity Authority with the ordinary electrical distributor and contractor was uncommercial and unjustified and would ultimately destroy the independent electrical contractor. That would be a bad thing for the country and the public which would not get the service it needed. The B.R.A. could exercise a considerable influence in this direction.

Sir Harold considered that the whole future of British industry was fundamentally brighter than it was a few months ago, as the Budget showed. So far the policy had been one of restriction and restraint. Now the individual was to be allowed to exercise his responsibility. Purchase tax had been used to settle the pattern of spending and living. The public must be allowed to manage its own affairs. Politicians and economists could not save the country—the people must save themselves.

Mr. E. G. Batt, director and secretary, responded to the toast. Speaking of the members' export achievements—a sixfold increase in five years—he said that the financial return in relation to the materials used was among the highest of all British industries. They were faced with a serious shortage of materials and at the same time had been told that their exports of domestic refrigerators should be raised from 66⅔ per cent to 85 per cent of total production.

Export Difficulties

Increasing difficulties were being encountered in export markets. Australia had taken 16 per cent of members' total exports and her decision to cut imports was a severe blow. Last year the British refrigeration industry had shipped to Australia 4,250 tons of equipment valued at £2,138,000. It seemed likely that New Zealand and possibly others would follow Australia's example.

If these markets were lost the Board of Trade should help them when negotiating new trade agreements. For instance the agreement with France should not preclude them, as it now did, from supplying certain classes of equipment which Belgian manufacturers were free to supply.

It might well be that on the grounds of national security manufacturers who had done their proper share of export sales should be allowed to maintain production and, having disposed of as much as possible abroad, to offer any surplus in the home market—if necessary at a reduced rate of purchase tax. If a national emergency arose the refrigeration industry must be ready to meet demands for equipment, much of it of special and complicated design.

Mr. Batt went on to say that although British manufacturers were forced to depend on export trade and less was available for the home market, licences of ever-increasing value were being granted

by the Board of Trade for the importation of American and Continental refrigeration equipment. Last year equipment to the value of £700,000 was allowed in under this heading. That such a state of affairs could exist was sheer unadulterated nonsense and must be stopped. The dollars and sterling thus spent could be better employed in purchasing essential raw materials.

The distributors of refrigeration equipment were faced by a diminishing availability of new equipment and purchase tax and hire-purchase restrictions did not make their task any easier. The manufacturers were deeply concerned at their position and would do everything possible to see that as much new equipment as possible was made available to them.

The chairman's health was proposed by Mr. A. H. Bellhouse (member of the Council) and Mr. Leach briefly responded.

ANNUAL REPORT

The Association's report for 1951 shows that at the end of the year the membership was as follows:—Machinery manufacturers, 20; cabinet and cold store manufacturers, 27; distributors, 146; and associates, 18. The Council consisted of the following members:—Representing the Machinery Manufacturers' Section: Frigidaire Division of General Motors, Ltd., General Electric Co., Ltd., Graham-Encock Manufacturing Co., Ltd., International Refrigerator Co., Ltd., Marco Refrigerators, Ltd., Nash-Kelvinator, Ltd., Pressed Steel Co., Ltd., and York Shipley, Ltd. Representing the Cabinet and Cold Store Manufacturers' Section: Craig-Nicol and Smithfield Refrigerator Co., Ltd. (deputies, D. Drake & Son, Ltd., and B. Jaquiss & Sons, Ltd.). Mr. A. E. Leach (Marco Refrigerators) was unanimously elected chairman of the Council.

Eight members participated in the refrigeration display in the exhibition arranged at the British Electrical Power Convention and Mr. E. G. Batt presented a paper surveying the industry at the Convention.

The Association has continued to be represented on various British Standards Institution Committees and panels dealing with refrigeration. The director and secretary is a member of the Postmaster General's Advisory Committee on radio interference and it is understood that recommendations dealing specifically with interference caused by refrigerators are now being considered by the Postmaster General.

In connection with the eighth International Congress of Refrigeration, the Council organized a comprehensive exhibit and entertained leading overseas delegates to a luncheon.

During the year the Council has had the supply of materials under constant review. Specific action has been taken with Government Departments in respect of steel of all classes; copper, brass and zinc; hydrochloric acid; sulphuric acid and sulphur; phenol and meta cresol; and stipple glaze.

Comprehensive forms of conditions of sale for both domestic and larger refrigeration equipment were published for the guidance of members. The Council has continued to support the work of the National College for Heating, Ventilating, Refrigeration and Fan Engineering and has presented technical books to the most successful students.

Switchgear Standardization

A JOINT paper on this subject was read in Cardiff recently at a meeting of the South Wales branch of the Association of Mining Electrical and Mechanical Engineers by Messrs. V. W. Lowe and J. Vaughan Harries, Brush Electrical Engineering Co., Ltd.

It was observed that, although this subject had often been discussed, there was rarely any expression of the views of men engaged in the mining industry. The authors pointed out that the reports of the Lemon Committee and the Anglo-American Council on Productivity dealt at great length with practically every aspect of standardization and the main reasons for the wide and often excessive variety of gear in this country, with conclusions worthy of consideration. Recommendations were made on systems of busbars, sizes and types of circuit breakers, dimensional standardization, protection and instrumentation, operating mechanisms, cable boxes, inspection, testing and maintenance.

The authors expressed an anxiety for knowledge as to what the personnel making up areas and divisions of the Coal Board thought of standardization and whether it was felt that the matter was one of national importance as far as the mining industry was concerned.

The main reasons for to-day's situation were largely natural progression and economy. Large sums of money had been converted into forms of patterns, machine tools and equipment and naturally manufacturers had been very reluctant to adopt new standards. The great weakness of our selling methods was that makers had often chosen to compete with each other when trying to meet the exact requirements of customers. To be fair one must admit that there were too many firms making switchgear in wasteful variety in this country and that too many users considered and were even willing to pay for non-standard articles.

An appeal was made for a spirit of co-operation between areas and divisions, and for better understanding between manufacturers within the industry. The study of standardization should be the goal of the maker and user and when a common basis had been decided upon it should be adhered to by all concerned.

The discussion was opened by Mr. T. G. Dash, chief engineer, No. 5 Area, National Coal Board, South Western Division.

Long-Distance Power Transmission

The Scope for High Voltage Direct Current

In a recently published technical report* the British Electrical and Allied Industries Research Association has summarized the present position and future possibilities of power transmission by using direct current at high voltages. This report deals with the technical and economic aspects in relation to the increasing complexity of the problems entailed in the transmission as alternating current of larger amounts of power over longer distances.

Length of line and power per circuit adversely affect system stability; the latter cannot safely be increased much beyond the surge impedance load of a line without the use of costly stabilizing equipment. The limit is about 250 miles and for greater distances intermediate stations are necessary. Power per circuit can be increased by raising the voltage, but the greater corona loss then entails an increase in the number or size of conductors.

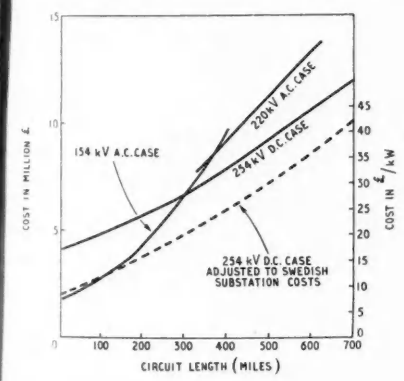
For less than 300 to 400 miles d.c. is not considered to be competitive with a.c., except where insulated cables are required (e.g., under water); at 25 miles d.c. cables are said to become definitely superior.

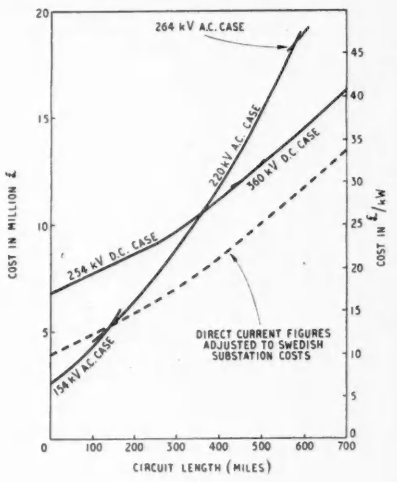
Reasons are assigned for the unsuitability of earlier d.c. systems in relation to the circumstances now envisaged. Chief among them were the Thury system with its large number of rotating machines, the Calverley-Highfield transvertor, the Siemens contact rectifier with numerous contacts operated synchronously and the Marx air-blast rectifier which suffered from the rapid burning away of electrodes. The mercury arc rectifier is the most practicable device for conversion at both ends of a d.c. line.

Overseas Investigations

Reference is also made to experimental work, yielding basic information, carried out in Germany and Switzerland. In Sweden a 30 mile d.c. line at 6·3 MW and 90 kV has operated satisfactorily for some years and a scheme to transmit 20 MW at 200 kV from the mainland to the island of Gottland by single-conductor cable, using the sea as an earth return, is expected to be carried out by 1954.

Costs of 240 MW (left) and 400 MW overhead lines and terminal stations—1947


154 kV A.C. CASE
220kV A.C. CASE
254 kV D.C. CASE
254 kV D.C. CASE ADJUSTED TO SWEDISH SUBSTATION COSTS
COST IN MILLION £
COST IN £/kW
CIRCUIT LENGTH (MILES)


264 kV A.C. CASE
220kV A.C. CASE
360 KV D.C. CASE
254 kV D.C. CASE
154 kV A.C. CASE
DIRECT CURRENT FIGURES ADJUSTED TO SWEDISH SUBSTATION COSTS
COST IN MILLION £
COST IN £/kW
CIRCUIT LENGTH (MILES)

* Technical report B/T111, "Review of Problems of H.V. D.C. Transmission." British Electrical & Allied Industries Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey. (7s 6d.)

If an a.c. line is converted to d.c., two conductors will carry at least 1·33 times the previous load for the same percentage ohmic losses. Hence a double-circuit three-phase line converted to a three-circuit d.c. line can carry double the power. Alternatively, to transmit the same power, the insulation level of a d.c. two-conductor circuit need be only 0·865 of that of a three-phase line. Permissible working stress for mass impregnated cables is 50 kV/cm or for designs which suppress ionization 100 kV/cm, from which it appears that with d.c. at 400 kV the dielectric would be only 0·5in, equivalent to that required for a 132 kV oil filled or gas-pressure cable.

With three-phase a.c. at 50 c/s, wattless kVA per circuit mile is about 2,000 at 132 kV, 5,000 at 220 kV and 15,000 at 400 kV. Charging current stations would be required at intervals of 40, 25 and 15 miles respectively.

Conversion Equipment

On the other hand d.c. substations with conversion equipment cost about twice as much as equivalent a.c. substations. Safe commutation of invertors necessitates operation of convertors with a leading current and hence the provision of reactive kVA which may be from 50 to 80 per cent of the active power of the system. The value of this kVA component is independent of the length of line, thus differing from a.c. conditions.

Circuit breakers for d.c. are unlikely to be available for some time at economic prices as the current (which with a.c. passes through zero at each half cycle) must be forced down to zero from steady state or fault values and this involves the dissipation of large amounts of energy. This in the immediate future is likely to restrict the use of d.c. to point-to-point transmission, with switching through grid control of the convertors.

Valves suitable for commercial transmission may require a minimum rating of 500 to 650 A at 60 to 80 kV, but the nearest approach to such valves made in this country is of a different type and has a rating of 50 A at 17 kV. Problems connected with other apparatus, apart from switchgear, appear to be essentially an extension of well-established principles. Corona losses, insulation levels and interference with communications with d.c. have still to be investigated.

A 10 kW at 1 kV plant at the Electrical Research Association laboratories is giving useful information on control and protection and, to a less extent, on operation and interference. To give Britain experience to compete with other countries, it is recommended that a plant for 20 MW and 200 kV should be put into operation within the next eight years, to transmit energy over an existing line forming a link between two points on a large a.c. system, which could supply the wattless component.

Transmission from Coalfields

The transmission of 750 MW 150 miles from the Midland coalfields to London might be more economical than to transport fuel. Using a.c. four 275 kV lines would be required, which difficulties in obtaining wayleaves and through loss of amenities would make almost impracticable. With d.c. three cables could be used, the scheme costing (at 1947 prices) £18·95 million (£7·7 million for cable and £11·25 for stations).

Nineteen potential transmission schemes abroad of upwards of 200 MW and 200 miles are tabulated, involving an aggregate capital expenditure of £254 million at 1947 prices. Fourteen relate to a distance o more than 300 miles, costing £190 million (overhead £84 million, cable £19 million and stations £87 million) for which rectifiers and invertors with their auxiliaries and protective gear valued at £29 million (one-third of the station costs) would need intensive and costly development.

A comparison is drawn between a.c. and d.c. for three schemes without cables to transmit a total of 1,280 MW for an average distance of 370 miles. The cost with a.c. is estimated at £39 million (£26 million for overhead lines and £13 million for substations); with d.c. the expenditure would be £34 million (£15 million on lines and £19 million on substations)—a saving of about 13 per cent.

At present work is being carried out on submarine transmission, particularly in connection with Cook Strait between the North and South Islands of New Zealand, between England and France and between Sweden and Gottland.

An appendix to the report reproduces the principal calculations used for comparison between a.c. and d.c. overhead lines. Numerous references are made to the more important data sources.

Commerce and Industry

Contractors' Conference Arrangements

M.P.s Shown "Safety" Fires

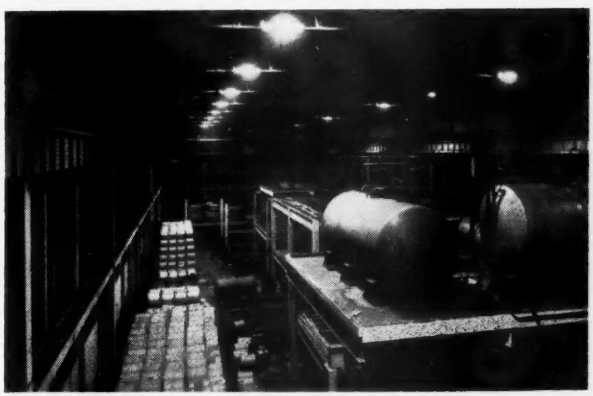
A PROVISIONAL programme has been drawn up for the annual conference of the Electrical Contractors' Association to be held at Eastbourne from 30th June to 2nd July. In general the arrangements will be similar to those of previous years. There is to be a meeting of the Council on the first morning (Monday) and delegates will register at the Grand Hotel during the day. In the evening there will be a reception by the president (Mr. Stanley N. Watkins) at the Floral Hall in the Winter Garden.

The Tuesday proceedings will begin with a civic welcome at the Floral Hall; the presidential address will follow and the rest of the morning and afternoon will be devoted to papers and discussions. The Mayor of Eastbourne will receive the delegates at the Floral Hall in the evening and there will subsequently be a dance and cabaret.

The annual general meeting is to take place on the Wednesday morning after which there will be the customary votes of thanks and the installation of the new president. A garden party will be arranged for the afternoon and the proceedings will close with a smoking concert and dancing in the evening.

Lighting of Raw Material Plant

Engineers of the British Thomson-Houston Co., Ltd., have used "Mazda" blended lighting fittings to good effect in providing illumination for the Chemical Department of the new raw materials plant of Nelson Silks, Ltd., Lancaster. Sixteen fittings, each housing one central 1,000 W tungsten lamp and two 400 W horizontally-burning mercury vapour lamps, are fixed on roof-trusses at a height of 62ft from floor level. This arrangement provides adequate and evenly distributed illumination over the whole department. The installation work was carried out by Nelson Silks' own electrical staff.



A section of Nelson Silks' new raw materials plant illuminated by "Mazda" blended lighting

The Bournemouth Convention

Certain alterations in the programme of the 1952 British Electrical Power Convention (Bournemouth, 16th–18th June) have had to be made. The Convention will now open at the Town Hall on 16th June and the papers on electric water heating, electric cooking and comfort heating will be presented there on that day instead of at the Pavilion. The papers on research will be read on the 17th at the Pavilion to which the Convention will be transferred on that day.

Material Price Index

There was a further small rise in February in the Board of Trade price index for materials used in the electrical machinery industry; it was 160·2 (June, 1949 = 100) against 160·0 in January and an average of 151·9 for 1951.

E.D.A. Public Speaking Finals

The national finals of the E.D.A. Public Speaking Competition will be held in the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2, on 17th April, to which members of the electricity industry are invited. Eight competitors will take part in the men's finals, which will

commence at 10.15 a.m., when the judges will be Miss Vera Norvick, assistant secretary, E.A.W., London, Mr. Frank Phillips of the British Broadcasting Corporation, and Mr. B. J. Ross, history master, City of London School. At 2.15 p.m. the first of the ten women finalists will take the platform. The judges on this occasion will be Mrs. Frank Forrest, of the E.A.W. Council (Lyme Regis), Mr. Frank Phillips, and Mr. J. W. Thomas, director of training, safety and welfare, B.E.A.

Transformers for British Railways

For the change of frequency scheme to be carried out by the Southern Region of British Railways, the British Electric Transformer Co., Ltd., has received an order for two 45 MVA, 3-phase, 50 c/s, 66/33 kV, star/delta connected, ON/OFB, outdoor type transformers with fully automatic on-load tap-changing equipment. The company will also supply two earthing transformers.

Drakelow Generating Centre

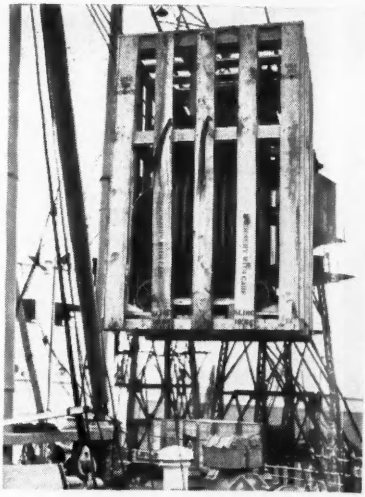
Referring to the article published under the above title in the *Electrical Review* of 15th February, we regret that we omitted to mention that the consulting civil engineers for the station are L. G. Mouchel & Partners, Ltd., who kindly lent us the photograph of the "artist's impression" of the completed station, from which we reproduced our last illustration.

Swedish Power Line Condenser

A hydrogen cooled synchronous condenser ordered by the Swedish State Power Board from the A.S.E.A. is expected to be installed later this year at Hallsberg, central terminal of the 600 mile 380 kV overhead power line from the Harsprånget plant within the Arctic Circle. This rotary condenser will be rated at 75,000 kVA and 19 to 21 kV whereas other such machines hitherto used in Sweden have ranged between 10,000 and 50,000 kVA at 10 kV.

Plant for Australia

The accompanying picture shows part of a shipment of nine transformers manufactured by Thermocontrol Installations Co., Ltd., London, to special requirements of the Australian Ministry of Works and Housing, being loaded aboard s.s. *Dunedin* at Royal Victoria Docks, London. The complete batch consists of four 500 kVA, three 200 kVA and two 300 kVA transformers having a ratio of 10,500/430 V, delta/star connected for outdoor operation. They are required to be mobile for use on various defence projects and are therefore mounted on flanged wheels so that they can be moved on rails. The 300 and 500 kVA transformers were made to special dimensions in order that they may be installed in various substations and the 200 kVA transformers are suitable for normal outdoor operation, being



A Thermocontrol transformer being loaded at Victoria Docks for Australian defence plants

fitted with standard outdoor type porcelain bushings. Fittings include conservators, silica gel breathers, explosion diaphragms and dial type thermometers, and the 500 kVA transformers are fitted with alarm contacts, relays and thermostats. The actual production time for the complete order was just under four months.

Electric Tools and Production

In an endeavour to contribute to the drive for increased production, Wolf Electric Tools, Ltd., has produced a film strip in colour showing how the individual can increase his own personal prosperity by the correct use of portable electric tools and at the same time assist in the drive for more production. The film strip was shown in London on Friday last and will be shown in all industrial centres throughout the United Kingdom. It will also be made available to individual firms or organizations who are interested in the use of portable electric tools.

A special address has been prepared in conjunction with the film strip in which suggestions are made to enable operators to speed up output. Wolf representatives up and down the country will be available to provide these lectures. At last Friday's showing the lecturer was Mr. R. F. Hatto, sales director. The film strip is roughly divided into three sections covering drilling, grinding, and miscellaneous tools for special purposes, and shows the importance of such matters as using the right drills for various jobs, correct sharpening, the use of the right grinding wheels and the importance of using tools of the correct voltage. Mr. Hatto's commentary, which was an abridged

version of the specially prepared address, was lucid and couched in simple terms which will be readily grasped by operators of electric tools.

E.T.U. Conference

The annual policy conference of the Electrical Trades Union is to be held at Eastbourne during the week beginning 26th May.

Street Lighting Conference

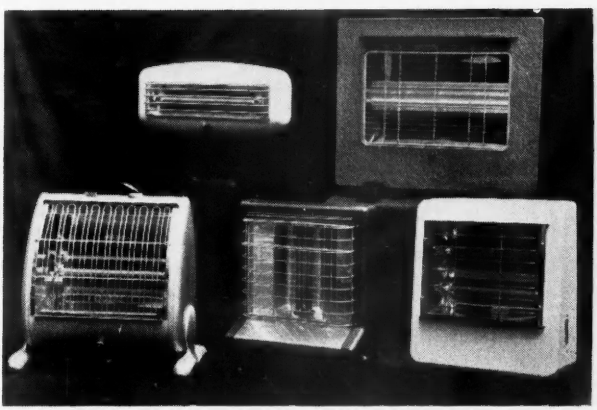
A half-day conference on street lighting will be held at the Midland Hotel, New Street, Birmingham, on 2nd April, and it is expected that fifty to sixty borough, urban and rural district councils will send representatives. The conference has been arranged by the Central England Area of the Lighting Service Bureau and two papers will be read, the first by Mr. E. B. Sawyer (manager, Lighting Service Bureau), entitled "The Economics and Practice of Modern Electric Street Lighting," and the second will be given by Mr. F. Jamieson on "Electric Lamps." After discussion on these two papers, films of good street lighting practice will be shown.

Illumination Design Courses

The following two Illumination Design Courses have been arranged by Mr. J. W. Howell, Mid-East England area engineer of the E.L.M.A., Lighting Service Bureau, 24, Aire Street, Leeds, 1, from whom tickets and or programmes may be obtained:—Evening course: Technical College, Lincoln (28th May, 11th, 18th and 25th June). Afternoon course: Lecture Theatre, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford (30th April and 7th May).

"Safety" Fires at House of Commons

At the request of Mr. D. G. Bullard, the Conservative M.P. for South West Norfolk, the Electrical Development Association arranged for six electric fires fitted with guards complying with B.S.I. standards to be exhibited in a Committee Room of the House of Commons on 13th March. There they were inspected by a large number of Members of Parliament. The following day Mr. Bullard moved the second reading of his Bill to prohibit the sale of heating appliances without effective fireguards. Besides the models illustrated the Ferranti "Minera" was shown.



Five of the six "safety" electric fires exhibited at the House of Commons. Left to right: (top) "Creda" flat-back wall fire and Ferranti "Safera"; (bottom) Belling "Homeguard," a G.E.C. model and Berry "Vanguard"

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £148 0s 0d
COPPER, H.C. Electro	ton £227 0s 0d
Fire Refined 99·7 per cent	ton £226 0s 0d
Fire Refined 99·2 per cent	ton £225 10s 0d
COPPER Tubes	lb 2s 2d
Sheet	ton £280 0s 0d
H.C. wire and strip	ton £254 0s 0d
LEAD, English	ton £164 10s 0d
Foreign	ton £163 0s 0d
MERCURY	flask £73 10s 0d
TIN	ton £977 10s 0d
ZINC, G.O.B. Foreign	ton £190 0s 0d
Electrolytic	ton £194 0s 0d
BRASS Tubes	lb 2s 1d
Sheet	lb 2s 4½d
Wire	lb 2s 7½d
PHOSPHOR BRONZE	
Wire	lb 3s 7½d
RUBBER, No. 1 R.S.S. spot	lb 33½d–34d

British Standards

Four clauses have been changed in the revision of B.S.438 (price 2s post free) for cooker control units of 30 A in two-wire circuits not exceeding 250 V, which should not be employed in an ambient temperature exceeding 50 deg C without being derated. Clauses 5 and 6 have been altered to permit the use of a shuttered socket outlet and fused plug in accordance with B.S.1363 while Clauses 3 and 4 have been amended to cover the requirements for the control switch and indicating device.

The revised edition of B.S.1270 (price 2s post free) now schedules many more sizes, types and

colours of fluorescent lamps now available. It is confined to tables of dimensions, nominal efficiencies, length of service life, etc., and a system of coding has been used to keep the schedule within reasonable limits.

A standard electrolytic method is described in B.S.1825 (price 1s 6d post free) for determining the amount of cadmium in straight copper-phosphorus-cadmium alloys (as specified in B.S.23) for trolley and contact wires for electric traction. It specifies reagents and recommends methods of sampling and of testing.

Copies of the documents are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1.

Voltage Transformers

Mr. N. Ashton, the author of the article on this subject in our 7th March issue, thinks that there may be some misunderstanding of the opening sentences of the article. It should therefore be observed that metalclad switchgear needs voltage transformers that can readily be isolated, either by withdrawing from plug and socket contacts or by other means. For system voltages up to 22 kV isolation is by withdrawal of the transformer from sockets in the switchgear, the primary current being broken in air at the spring-loaded contacts of the h.v. bushings. At 33 kV and above, however, it is preferable to interrupt the primary current under oil; so voltage transformers for such higher voltages are provided with means for accomplishing this, even when they are of a withdrawable type.

There was an inadvertent transposition of the captions to the last two illustrations in the article; the physically larger unit is the higher voltage type.

Trade Announcements

The Electric Construction Co., Ltd., announces the retirement of Mr. F. W. Tunstill, Chelmsford, Essex, who has been for many years its sole representative in the counties of Essex, Suffolk and Norfolk. A former member of the company's London office staff, Mr. R. H. Bennett, 31, Brandeston, Woodbridge, Suffolk, is taking over the representation.

A new branch has been opened by **Enfield Cables, Ltd.,** at 15, Chapel Street, Luton (telephone: Luton 4234). The branch manager is Mr. J. F. Parnell, who for many years was a senior sales engineer for the London area.

The offices and works of **D. H. Bonnella & Son, Ltd.,** are now at West Hill, Hoddesdon, Herts. (telephone: Hoddesdon 2283; telegraphic address: Boncinello, Waltham Cross).

A new office has recently been opened by the **Ransome & Marles Bearing Co., Ltd.,** at 291-295, Corporation Street, Birmingham. Plans have been prepared for this single-storey building to become eventually a block of offices consisting of four floors, which will be completed by the company as soon as the present building restrictions have been relaxed. Mr. J. C. Bayley continues as the Midlands area manager operating from this address.

Mr. J. H. Scott, sales representative in the Midlands and the North for the **English Glass Co., Ltd.,** will now also be covering London, the Home Counties, and the South of England, as from 1st April.

Welsh Engineering Wages

A report in the *Manchester Guardian* states that on 14th March, employers' and men's representatives on the Welsh Engineers' and Founders' Conciliation Board failed to reach agreement in Swansea on a claim by the men's side for an increase in wages. The claim of the eleven unions represented—headed by the Amalgamated Engineering Union and the Electrical Trades Union—is for £1 2s 6d weekly. Negotiations will continue. Although the board legislates for between four thousand and five thousand men many non-member firms also follow its findings so that the number of men concerned is usually over seven thousand. This number will be affected by a decision to increase the annual holidays with pay from one week to two.

English Electric Transformer for California

The United States Bureau of Reclamation, which is responsible to the U.S. Government for the installation of the Folsom power station, California, has placed an order for an 80,000 kVA, 230/115 kV, 3-phase, auto-connected transformer. The price, $200,000, is about $56,000 lower than the nearest American tender.

Lead Price Reduction

The Ministry of Materials announced this week a reduction in the price of imported soft pig lead from £170 to £163 per ton. Because of the improvement in supplies the restrictions on purchases of lead are removed. For the past year or so deliveries have been restricted to 90 per cent of the 1950 monthly average consumption.

Ideal Home Exhibition

The " Bubblewasher " clothes and dish washer referred to last week (page 553) is made by the Overseas Engineering Co., Ltd., Cedar Merchandise Inc., Ltd., being the distributors for the home market.

Meter Parts for Argentina

Parts and accessories for the manufacture of electric meters for 220 V and up to 10 A are to be admitted into Argentina free of duty, subject to proof of end use.

Oil Engine Production

Extensive Factory at Leeds

WHEN we set out last week to visit the Airedale Works, Leeds, of J. & H. McLaren, Ltd., we felt a little uncertain whether we should find sufficient "electrical" material for an article and we had in mind the unusual relationship between the electrical industry as a whole and the oil engine manufacturing industry. But we soon found two small private generation stations in operation, each supplying a section of the works with electricity by means of oil engine driven alternators. From the electrical angle this seemed to be quite in order, but a little later on when we saw two oil engines driving compressors for the works general air supply we had misgivings, for nowadays in British works this is not normal.

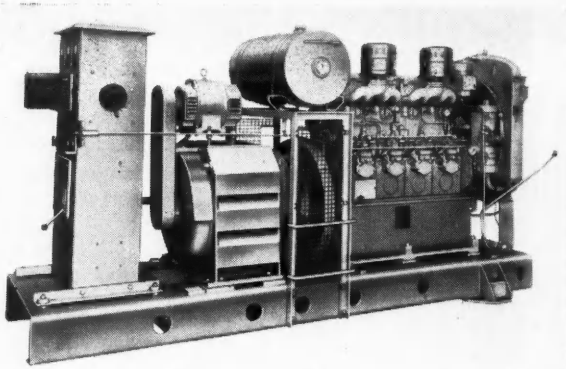
As the tour advanced, however, we noted that all the direct production machines were electrically driven and that, as a whole, the production plant layout represented an excellent electrical installation scheme with individual driving and incorporated motors and controls everywhere.

Colonel H. T. Thornley, managing director of the company, put us completely at ease by saying that the adoption of electric drive throughout for the direct production plant was the logical path and, indeed, the only reasonable thing that could be done.

McLaren's acquired the Kitson Locomotive Airedale Works in 1945 and after much restoration, reconstruction and extension work the total floor area now devoted to actual production by the company, including the older and much smaller Midland Works which is still retained, is about 0·25 million sq ft out of a total floor area, including stores, offices, services and roads and yards of about 0·6 million sq ft.

The factory has been entirely re-equipped with machine tools since 1945, and it seemed to us that every conceivable make of machine was represented somewhere in the factory, and these included a few surprises such as a Belgian "Gilly" machine at work on main crank boring. On the whole we would say that the machines throughout represent an extensive modern installation for high grade production,

The production plant represents an excellent electrical installation with individual driving and incorporated motors and controls everywhere; the light machine shop



The 55 kW diesel-electric generating set seems to be the popular choice for both individual and parallel running

without anything which is outstandingly spectacular or new.

A few of the items which caught our eye in particular are: the production of the actual pumping members of gear pumps on the gear generation principle on Sykes cutting machines; the turning of multiple crank shafts on vertical lathes on which only those bearing sections which are aligned are machined at any one time; both internal (cylinder holes) and external (flange faces for port connections, etc.) machining done on one machine with a central vertical revolving cutter-carrying member for the internal work and two outer multi-cutter units revolving in the vertical plane for the external work; and the machining of a 4ft 6in diameter flywheel for a 80 h.p. twin cylinder horizontal diesel engine on a Colburn motorized planer. Further, the hydraulic testing at 1,500 lb/sq in of cylinder heads for valve leakage and porous casting detection was an insight into how such testing work can be incorporated in the production arrangements.

In the foundry, in the welding shops and on the assembly lines we saw evidence of the very considerable extent to which fabrication has replaced casting. Apart from the fundamental foundry availability question, the decision, we were told, usually rests with the designer who takes account of production suitability, etc., although no doubt in the long run the customer makes the decision, if only by his expression of the general satisfaction or otherwise with what he has been supplied. Economics enter into this matter too, and there is no doubt that fabrication is generally the less expensive method of production.

When walking through the extensive welding shops where the work going on was mainly in connection with the fabrication of alternator-set bedplates, we had the impression that all the welding was carried out by the arc method and that most of the equipment was of the transformer type.

We found it difficult to obtain even a rough estimate of the proportion of the McLaren engines which are ultimately used by the customers for electricity generation, probably, we think, because, like the electric motor, many engines are sold merely as power driving units without any knowledge by the manufacturer of their ultimate use. With regard to the self-contained generating sets, however, members of the staff mentioned 40 per cent and 5 per cent as likely figures for vertical and horizontal engines, but Colonel Thornley thought the real figures were much higher.

Electrically, probably the most interesting product is the company's diesel-electric generating set which was introduced to meet the critical fuel shortage situation in the winter of 1946–47. These sets are produced in 40, 45, 70, 85 and 110 kW capacities, but the 55 kW set seems to have become the popular standard for both individual and parallel running. Large numbers of these sets are finding their way to the Australian sheep ranches, to outstations in the South African veldt, to villages in South-East Asia and to Pacific Island hospitals. These 55 kW McLaren/Brush generating sets are the units employed in the Airedale Works private generating stations to which we have referred, two sets in one case and four in the other. The four-cylinder engines are rated at 88 h.p. at 1,000 r.p.m., and the directly coupled alternator generates at 400/440 V three-phase. The salient pole alternator has a screen protected enclosure, and a separate belt driven exciter is mounted on it.

District Heating

Recent Developments Favour its Adoption

IN a paper read on 12th March before the Institution of Engineers-in-Charge, Mr. A. E. Margolis discussed recent technical developments, which, in relation to higher fuel costs, increased the advantages of district heating. Heat production at low cost, together with smoke prevention, he submitted, could be obtained only by the burning of poorer qualities of coal in large high-efficiency plants with specialized staffs and up-to-date equipment. The heavy capital expenditure entailed in providing independent boilers for giving a straight heat supply, coupled with distribution losses, restricted its application to small areas of concentrated demand, whereas a combination of heat and electricity generation provided a relatively inexpensive source of heat for hot water transmission required for economic success in view of the low annual load factor.

The chief difficulty in introducing district heating lay in the transmission and distribution systems. A double set of heat-insulated mains (flow and return), fitted with expansion devices and rollers, had to be run in conduits, often in congested sub-soils.

Balancing Peak Demands

Peak demands for heat and for electricity did not coincide. Balancing the two by running back-pressure and condensing sets in parallel was expensive, because the back-pressure plant would not be used in mild weather at the time of the electrical peak and its cost and that of the additional boiler capacity would be debited to district heating. By putting back-pressure and low-pressure condensing units in series, the load factor of the latter was improved and its cost was much less than in the previous case. Although pass-out turbines cost less than separate condensing and back-pressure turbines, the overall steam consumption was much higher on account of the great variations in the heating demand. The most efficient way of balancing heating and electrical loads was to employ back-pressure turbines with hot water accumulators (for the introduction of which the author was responsible) thus enabling both services to be run independently with a reduction in capacity of boilers and generating sets of 40 to 50 per cent when heating was not required at night.

Technical improvements which favoured district heating, apart from the adoption of hot water accumulators, were: an increase in the adiabatic heat drop; the introduction of the double heat-storage system; a reduction in the size of transmission and distribution mains by increasing the temperature drop. Illustrating the influence of higher initial steam pressures and temperatures and lower exhaust temperatures, Mr. Margolis showed that, if water for distribution were heated at 6 lb/sq in abs., the power generation factor (i.e., the electricity output per million B.Th.U.) would be 101·5 kWh as against 72 kWh at a back pressure of 40 lb/sq in, and that the reduction of boiler capacity compared with that in a condensing station with a 29in vacuum could be 21·5 per cent.

Heat Storage

Double heat storage comprised storage at the power station or substations served directly with the addition of electric thermal storage at points too remote for hot water transmission, the electricity being generated by night when no heat was used. By increasing temperature drop between flow and return, the size of the pipes could be greatly reduced. At a temperature drop of 100 deg F (instead of 25 deg F as formerly) and a pressure drop of 5in water head per 100ft, the heat carrying capacity of, for instance, a 20in transmission main amounted to 286 million B.Th.U./hr compared with 4·3 million for a 4in main. Losses per mile for well insulated 12in mains were about 0·77 per cent and for 20in mains only 0·32 per cent, but were much higher for the smaller distributing pipes and connections. As with heat-electric generation the heat losses increased the electricity output, their cost might be only 20 per cent of that

incurred with a straight heat distribution system. Large scale district heating with heat-electric generation might create conditions favouring the application of heat pumps instead of electrode boilers in remote areas. Even so such considerations as increase of the range of heat supply or saving in cost of heat transmission mains would be of decisive importance and not reduction in the cost of heat. The author dealt with the genesis and performance of several district heating schemes abroad and described the Pimlico scheme (the first in the world to depend upon exhaust heat alone), particulars of which were given in our issue of 3rd August last.

Electrical Sign Makers

THE annual general meeting of the Electrical Sign Manufacturers' Association was held at the Café Royal, London, on 11th March. Mr. G. S. Campbell (Franco Signs, Ltd.) was in the chair and a large number of members attended from all parts of the country. The meeting was preceded by the annual luncheon at which a number of leading personalities in the outdoor advertising and electrical industries were present.

The annual report of the Association shows that 1951 was again a difficult year for the electrical sign industry which has had to contend with and overcome many troubles especially in the field of lighting restrictions, material shortages, and Town and Country Planning controls.

All new outside illuminated signs have to be first approved by a local planning authority. This is so even if the sign is merely a name sign such as on a hotel, café, or shop. Accordingly one of the Association's main aims is the reduction of this all-embracing control; the report devotes much space to its efforts to free the industry from this burden.

There seems every reason to hope that lighting restrictions will be easier next year. In this connection the Association says that it feels sure, however, that but for the assurance obtained last April from the Ministry of Fuel the industry might well have experienced another " black out " as in the previous winter.

The supply of materials, which has been difficult for some time, was made more so during the year by further restrictions on the use of metal but a number of small concessions were obtained. However, many of the restrictions on materials relate to advertising signs only, it now being recognized that directional signs and signs which identify the premises on which they are displayed perform a necessary public service.

The Association has continued in its endeavour to provide prompt information on all matters affecting the interests of members and during 1951 a total of 94 information circulars and memoranda were sent to them. The advisory services of the Association have also been well used.

Transparent Metal

A METHOD of coating glass with a thin, transparent metal oxide film which will conduct electricity has been developed at the National Physical Laboratory. The film can be heated by passing a current through it and it could be used, for example, on aircraft windscreens, to keep them free from ice and snow.

Not all metals produce transparent oxide films, but one which has given good results is tin. It can be deposited very evenly on the glass by techniques which are already well understood in industry. The glass is then heated to near the softening point and cooled again. The tin oxidizes and becomes transparent. Finally the film is washed in water and dried, a step which increases its conductivity. After this it is hard and inseparable from the glass surface and is resistant to chemical attack.

Visibility through the glass is reduced by an amount which is negligible for all practical purposes. The coating has a resistance of about 1,000 ohms between the opposite edges of any square area and enough current can be passed through it to keep the surface of the glass so hot that it is impossible for ice and snow to form on it or for condensation to make it misty. In practice the film would be sandwiched between two layers of glass.

Ceramic materials as well as glass can be treated by the process, and there are many uses for it in the electrical industry, for instance in the production of fixed and variable resistances. The glass can also be used to avoid static charges accumulating on the windows of instruments when they are cleaned in dry weather. This static electricity can lead to false readings and it was to solve this problem that the research was originally begun at the N.P.L.

Fair Trading Policy

AMENDMENTS to the Electrical Fair Trading Policy (Edition 4) are announced by the Electrical Fair Trading Council. Domestic cookers are deleted from Schedule 5, Category 3. Schedule 10 (Synchronous Clocks) is replaced by a modified schedule. Category 1 now covers clocks bearing a list price of 65s or below (exclusive of purchase tax); Category 2 is for clocks with a list price above 65s (excluding tax); and a new Category 3 embraces all types of wall clocks, including hanging types with dials not exceeding 18in diameter. There is a consequential amendment to Clause 6 (page 52) dealing with clocks bought by garages for their own use.

Electronic Telephone Exchanges

Possibilities Discussed by I.E.E.

In Great Britain and several other countries consideration is being given to the possibility of constructing automatic telephone exchanges using electronic switches to determine whether this system is cheaper and more reliable than electro-mechanical switching. In a paper which was presented at an extra meeting of the Radio Section of the Institution of Electrical Engineers in London last week, Mr. T. H. Flowers (Post Office Research Station) discusses some of the practical forms which electronic exchanges might take, the possibilities and characteristics of such exchanges and—cursorily—the questions of cost and reliability.

Multipled, frequency-division and time-division multiplex types of connector switches for speech and line-signal transmission are described, together with the typical subscriber's line equipment. General principles of selection systems, with examples of group and free-circuit marking and of a post-setting-up control circuit, are given. Transmission gain and loss, variation of loss, and distortion are features of electronic connector switches not found in existing types using metal-to-metal contacts, but, on the whole, better speech transmission could be given by electronic systems using the connector switches described in the paper, because of the 4-wire switching which would be inherent in most and desirable in all such systems.

Estimates of cost show favourable signs, but are as yet indeterminate. Total system costs must take into account line plant, the design of which may be profoundly influenced by electronic exchanges. Reliability has yet to be proved, but here the signs are also favourable.

DISCUSSION

In opening the discussion Mr. R. A. Moir (Standard Telephones) said that the developments which were contemplated would involve the employment of tools and components and circuitry which might be used outside the telephone field. It was therefore necessary to proceed slowly, because those other users should be consulted and the benefit of experience in these other fields obtained. For many years Commonwealth countries had in the main followed British Post Office practice. That too made it important not to rush development but to give it a broad basis which would make it suitable for use in more than one country.

Brigadier L. H. Harris (G.P.O.) said that by going over to automatic exchanges the Post Office had probably saved 18,000 operators. The electronic register translators were of great potential value in saving money and staff on trunk calls by increasing the proportion of calls completed without the intervention of an operator.

Performance Requirements

Dr. J. H. Mitchell (Ericsson Telephones) emphasized the fact that for a telephone exchange extremely long-lived components were required, which were apt to be very expensive, even when mass produced. For an electronic exchange an engineering performance would be required higher than had been customary in the best-quality radar or communication equipment yet produced.

Mr. W. Six (Philips, Holland) did not agree with the author that cold cathode tubes must have an attenuation of at least 1 db. He had a small electronic exchange working with cold cathode tubes in the speech path where the attenuation was of that order, but that was with a current of 6 mA, and, the attenuation being inversely proportional to the current, with a current of 20 mA the attenuation should be about 0·3 db.

Captain J. Legg said that in contemplating electronic exchanges they were led to consider also fairly radical changes in the rest of the network, notably on the transmission side, so that a long-term study of probable network developments was necessary in considering the advisability of introducing electronic exchanges.

Mr. E. P. G. Wright (Standard Telecommunication Laboratories) observed

that the electronic exchange envisaged incorporated some fairly basic changes, such as 4-wire switching throughout the exchange. Such an arrangement must show striking economies if it were to be attractive to many overseas telephone administrations, especially if they already operated an automatic service. It would also mean the need to develop, engineer and manufacture two totally different systems, which must result in increased cost. There was no doubt that mechanical exchanges would remain in operation for very many years, and he wondered whether it was not necessary to study the possibilities of some compromise system which would combine the best features of mechanical and electronic exchanges and have as a main objective the replacement of parts subject to wear and adjustment, doing away with troublesome ingredients such as contacts. If made to interwork freely with existing installations such systems would offer a relatively simple development programme which would enable important progress to be made.

Short-Distance Communication

Mr. F. O. Morrell (British Telecommunications) said that it was easy to devise a connector switch using valves instead of contacts, but it was expensive and one would be forced to adopt some carrier system such as was used on a long external line. Carrier working was economic over 50 miles or more, but was hardly a good way of getting from one end of an exchange to the other. As an alternative an ordinary mechanical switch could be used. It would be a simple piece of apparatus, and as it would do no selecting it would not have to operate very often.

Mr. D. A. Barron (G.P.O.) expressed surprise that the electronic engineers should be full of dismal forebodings and, as a development and maintenance engineer, said he would like to give them a word of encouragement. The electronic register-translator to which the author referred was now in service and had not yet had a single fault, though admittedly the period covered was only a little over a week. On the maintenance side it had been found so far that valve life was not necessarily going to be a dominant factor.

Dr. T. Kilburn (Manchester University) mentioned the experience obtained with their computing machine, which contained 4,000 valves, ordinary British pentodes and diodes. On the diodes failures occurred at the rate of 0·7 per cent per 1,000 hours, and on the pentodes at 2 per cent. If those rates continued, they would mean an average life of 5·7 years for pentodes and of 16 years for diodes. With resistors and condensers only eight out of 15,000 had failed in 2,000 hours, but considerable trouble had been experienced from dry joints. With one computing machine in the United States which used 18,000 germanium diodes, a failure rate of 0·05 per cent per 1,000 hours had been reported.

Importance of Flexibility

Mr. G. C. Hartley (Standard Telephones) emphasized that the supreme requirement of the new techniques must be versatility and flexibility. When the author said that the components were simple and few there was a danger that he was confusing components with tools. The tools which made up the system were assemblies of components which in many cases were quite complex.

Dr. J. R. Tillman referred to the quality of the transmission through the time division multiplex switch dealt with in the paper, which had 100 channels connected, a pulse repetition frequency of 10 kc/s and a pulse duration of 0·3 μ sec. The standard deviation of loss through the switch seemed to be not more than 0·75 db, and for a call between a typical London and a typical Birmingham subscriber might be 4 db. The distortion could be much reduced if the number of channels was reduced below 100.

Water Power in Mexico

THE construction of the largest hydro-electric plant in Mexico has begun, according to the director of the Federal Electricity Commission. The new plant, situated at Tingambato in the State of Mexico, will have three generating units capable of producing 150,000 kW. Water for the plant will come from the Ixtapantongo and Santa Barbara dams, as well as from the Tuxpan and Zitacuaro Rivers. A dam on the former river is to be built to assure a steady supply of water and the Department of Hydraulic Resources will co-operate with the Commission in carrying out channeling projects to supply the Tingambato plant with all water required.

The new plant will cost $13·7 million and funds will come from a $30 million loan given by the World Bank to the Federal Electricity Commission last year.

ELECTRICITY SUPPLY

Generation in February

Development Plans in Southern Rhodesia

FOR the second successive month the total installed capacity in B.E.A. power stations remained unchanged at 15,711 MW in February, though a small addition in Scotland raised the aggregate to 16,355 MW (against 16,351 MW). During the month three new boilers were commissioned by the B.E.A., namely 300,000 and 230,000 lb/hr International Combustion units at Poole and Nechells, respectively, and a 320,000 lb/hr Simon Carves boiler at Croydon.

The Ministry of Fuel and Power monthly statement shows that 5,786 million kWh was generated during February by the B.E.A., the North of Scotland Hydro-Electric Board and the Lochaber Power Co., an increase of 8·4 per cent compared with a year ago. This follows an increase of 6·8 per cent in January and a decrease of 2·4 per cent in December. Further details of electricity generated and sent out, together with installed plant capacity, are given in the table below.

Rural Supplies in Northumberland

Following representations from the Glendale (Northumberland) Rural District Council and the local branch of the National Farmers' Union, the South East Scotland Electricity Consultative Council is recommending the Electricity Board to regard as urgent the supply of electricity to 100 square miles between Scremerston, Lowick and Belford. It is expected that the Board will ask for a bigger capital allocation for rural development. Its present allocation is understood to be £20,000 annually. An increase to £50,000 may be asked for.

Freedom of Choice

Wellingborough (Northants) Urban District Council has been informed by the East Midlands Electricity Board that unless tenants of Council houses are given a free choice of electricity or gas for cooking purposes, the Board will require the Council to pay a service charge of £10 per house for electrical installations in new Council houses. The Council's Housing Committee is taking the matter up with the Ministry of Housing, the Urban District Councils' Association and the East Midlands Electricity Consultative Council.

Southern Rhodesian Loan

The International Bank for Reconstruction and Development, in a statement on the $28 million loan which is being made to the Government of Southern Rhodesia, says it is to help in the four-year plan for developing electric power production and distribution. The Electricity Supply Commission will receive 71 per cent of the loan and the remainder will be divided between the Salisbury and Bulawayo Municipalities.

Referring to the Commission's programme, Mr. A. B. Cowen, the chairman, said that as the Kariba Gorge hydro-electric scheme would not be in operation before 1961 it would be necessary

ELECTRICITY GENERATED IN FEBRUARY AND PLANT CAPACITY

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water	Total*		
British Electricity Authority ..	3,214	6·3	5,594	36	5,641	5,321	15,711
North of Scotland	16	1·3	24	116	145	144	644
Total for February, 1952	3,230	7·6	5,618	152	5,786	5,465	16,355
Corresponding total for February, 1951	3,045	9·5	5,189	132	5,340	5,051	15,163
Increase or decrease, per cent ..	+6·1	−20·0	+8·3	+15·2	+8·4	+8·2	+7·9
Total for year to date (2 months) 1952	6,784	15·7	11,729	376	12,139	11,472	
Total for corresponding months of 1951	6,478	20·5	10,968	278	11,285	10,679	
Increase or decrease, per cent ..	+4·7	−23·4	+6·9	+35·3	+7·6	+7·4	

* The total includes 10·9 million kWh generated by oil engines, and 4·8 million kWh by waste heat plants in February.

to build an additional station to serve the central system, for the site capacity at Umniati would be exhausted by 1956. At present the installed capacity there was 45,000 kW; another 40,000 kW would be available in 1953 and by 1956 there would be 120,000 kW. In the area of the Umtali power station a new station of 20,000 kW was to be erected on the Odzi River. An additional 10,000 kW set should be in operation at Shabani next May and another was on order to meet the expanding demands of the asbestos mining industry in the area. By 1954 the capacity of the Gwanda station would be raised to 15,000 kW. Transmission plans included the duplication of the 88 kV lines from Umniati to Gwelo, where ferro-chrome production was expected to begin in September, and from Umniati through Gatooma to Hartley.

Hire Policy

Stanley (Co. Durham) Urban District Council, which protested some time ago against the decision of the North Eastern Electricity Board to end agreements for hired wiring, has received a letter from the Consultative Council. This Council stated that the question of simple hire of electrical equipment had already been considered and after discussing all the circumstances surrounding the different systems in operation, it had been agreed that standardization was necessary and the Consultative Council had therefore approved the Board's proposals.

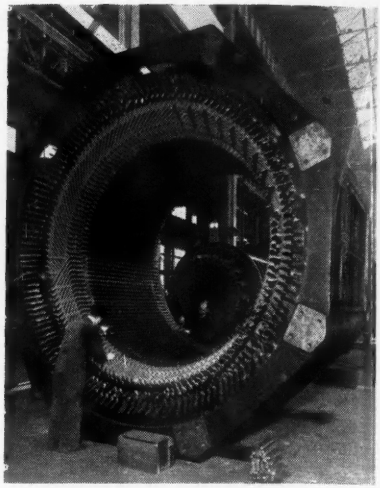
Street Lighting

That they were spending money to save money was a point made by Councillor G. Boast, in giving details of the HINCKLEY U.D.C.'s public lighting programme. He said that the 225 electric lamps to be erected during the ensuing twelve months would involve an annual maintenance charge of £898 against £948 for 101 gas lamps.

The Mayor (Councillor W. Parkes) recently switched on a new lighting installation at HALESOWEN which has cost £14,500. In the town centre there are eleven fluorescent lamps to give a natural colour to goods displayed in shop windows, and the remaining 228 lamps are of the mercury vapour type. The new system extends from Quinton to Hayley Green and from Halesowen to Cradley, and the Council is now considering a scheme for Long Lane, Blackheath, and Colley Lane, Cradley.

DOVER Corporation Works Committee recommends that the Town Council should proceed with a scheme for the installation of modern lighting in the widened Snargate Street.

Schemes estimated to cost £17,750 for improving the lighting in various streets in ST. PANCRAS have been approved by the Ministry of Transport. It is proposed to install mercury vapour lighting in Royal College Street and sodium lighting in Highgate Road, West Hill and South Grove. Hornsey Borough Council, which is preparing a £1,050 scheme for improving the lighting in Highgate High Street, has asked St. Pancras Council to meet half the cost as half the thoroughfare is within its boundaries.



One of five 25 MW, 11 kV, 600 r.p.m. water-wheel alternators for the Tungatinah power station of the Tasmanian Hydro-Electric Commission in course of winding in the new heavy engineering works of the General Electric Co., Ltd.

Wiring Regulations

A GUIDE to the I.E.E. Regulations for the Electrical Equipment of Buildings (12th edition) has been compiled by the Association of Supervising Electrical Engineers, 54, Station Road, New Barnet, Herts (3s 6d net in paper covers and 5s in cloth covers).

The guide is intended for the use of skilled electricians who require to grasp quickly the practical significance of those regulations that affect them most. This purpose is admirably served by the method of presentation. The actual wording of the I.E.E. document (which must always be regarded as the ultimate authority in questions of legal interpretation) has been retained when the meaning is immediately clear, but when this would be difficult to follow by those not trained to grasp its full implications, the relevant clause has been redrafted in more easily understandable language.

Any variations from the original are printed in heavier type. The implications of various requirements are also explained in a manner that recalls the valuable memorandum on the electrical aspects of the Factory Regulations. A helpful feature is the inclusion of numerous diagrams.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Milliwatt Calibrator

THE testing and calibration of thermocouples requires a highly accurate and stable source of low level power. In order to secure this accuracy and stability the obvious basis for such a source is a standard cell but for testing and calibration purposes a means must be found of obtaining appreciable power for any length of time. This problem has been solved by STANDARD TELEPHONES AND CABLES, LTD., Aldwych, London, W.C.2, in its 74131A d.c. milliwatt calibrator which uses a Muirhead miniature Weston standard cell, type D550A, as the reference voltage in a circuit which places no load upon it.

The standard cell e.m.f. is applied between one of the grids of a double triode valve and earth, and a voltage derived from a potentiometer network supplied with stabilized d.c. is applied to the other grid. By adjusting the potentiometer this voltage can be made equal to the standard cell voltage and then used as a reference against which the standard output of 1 mW into either 600 or 75 Ω can be checked.

Dry Shavers

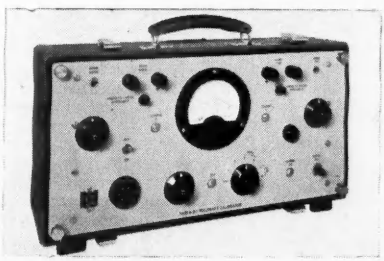
Three new " Rabaldo " dry shavers are being introduced by JOHN A. FRANSEN, LTD., Northwood, Middlesex—the " Multi Ras " and the " Dual Ras " Nos. 1 and 2. Unlike other razors there is no outer guard and the actual shaving blades operate directly on the skin; the lower blade is fixed. A transparent plastic removable hood acts as a trap for the hair shavings. All models are suitable for either a.c. or d.c.

The " Dual Ras," which has twin blades and is suitable for 200–250 V (other voltages available) sells at £6 13s (plus 35s 7d P.T.). The " Multi Ras " No. 1, with a similar voltage range but having four blades, retails at £8 15s (plus 47s 9d P.T.), while the " Multi Ras " No. 2, which is similar but is adjustable for all voltages between 100 and 250 V, costs £9 15s (plus 52s 9d P.T. in the United Kingdom).

Radiators and Towel Rails

The " Drydenair Dinkie " radiators have been designed by THOMAS DRYDEN & SONS, LTD., Grimshaw Street, Preston, Lancs, on the same general lines as the standard " Drydenair," the main difference being that the heat is radiated forward only, in a wide arc, from a totally enclosed element. Models are obtainable with feet for portable floor-mounting, or with brackets for wall-mounting. If it is desired to dry or air towels, etc., a chromium-plated towel rail can be supplied. Alternative loadings of either 250 W or 500 W are available.

1



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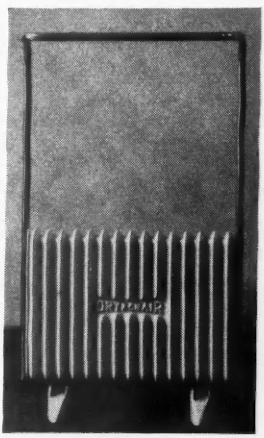

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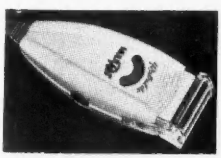


1. **Standard Telephones d.c. milliwatt calibrator**

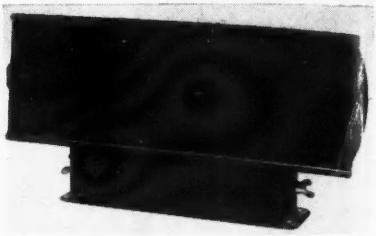
2. **" Drydenair Dinkie " radiator with towel rail**

3. **" Rabaldo Multi Ras " dry shaver**

A cast-iron construction has been employed with eight standard vitreous enamel finishes. The 250 W models cost £5 6s (plus £3 18s 3d P.T.) with feet and £5 (plus £3 13s 6d P.T.) for wall-fixing. The 500 W models cost an extra 5s (plus 3s 8d P.T.) and the chromium-plated towel rail is £1 5s (6s 3d P.T.).

Ultra-Violet Light Fitting

Many attractive effects can be produced on posters, hoardings, costumes, etc., by using the instant start ultra-violet light fitting now being made by the RADA SCIENTIFIC GLASS-WORKS, 56–61, Fuller Street, London, E.2. These units, which are finished in black crackle enamel, are available in six sizes, single and twin, 1ft, 2ft and 3ft, with ratings ranging from 10 W to 60 W. The control unit is used separately from the reflector and it can easily be detached for remote mounting.



"Rada" ultra-violet light fitting

Import Restrictions

IN his Budget speech the Chancellor of the Exchequer referred to the amendment of the Open General Licence to restrict imports of certain classes of goods. The Board of Trade has since published details of the amendment.

As from 12th March the goods specified will require licences if imported from outside the Scheduled Territories, Muscat and Oman. (The Scheduled Territories include Commonwealth countries (except Canada), British Trust Territories, British Protectorates, Burma, the Irish Republic, Iraq, Iceland and Jordan.) Goods in transit before 12th March are excepted but those not in transit before this date will require import licences even if they have been paid for, or if irrevocable credits have been opened or shipping space booked in respect of the goods.

For the present no import licences will be issued for the specified goods with the exceptions that the Board of Trade will be willing to consider applications in respect of goods subject to delivery under contracts fully entered into before 11th March and other goods subject to exceptional circumstances. A further notice will be issued before the end of April about future licensing arrangements.

The items deleted from the Open General Import Licence include the following:—

> Domestic dish-washing machines; refrigerators of a capacity exceeding 7 cu ft; bells and buzzers; blankets and pads, electrically heated; coffee percolators; electric cooking apparatus, and parts and fittings therefor; drink mixers; fans; floor polishers; gas lighters and lighter elements; hairdressing appliances; hand lamps, pocket lamps, hand torches and inspection lamps operated by a dry battery and cases therefor; irons, ironing machines, washing machines and wringers; kettles; lamps, filament or discharge (including fluorescent); lighting appliances and fittings not containing pottery or glassware; shavers; toasters; and vacuum cleaners and attachments therefor.

The Chancellor of the Exchequer also stated that he had decided, after consultation with the President of the Board of Trade, not to exercise for the time being his discretionary powers under Section 10 of the Finance Act, 1932, to issue duty-free licences in respect of certain consignments of imported machinery. In accordance with his statement, no applications posted after 11th March will be considered. The decision will be reviewed in the light of changing conditions and the Government proposes to use the interim period for a review of the underlying problems of policy and administration.

Indian Fan Industry

INDIAN fan manufacturers recently applied to the Government for protective duties on imported fans. The matter was investigated by the Indian Tariff Board which has found that there is no case for protective duties having regard to the comparative costs of imported fans and fair selling prices for the Indian products and to the present restrictions on imports. The Board also considers that there is no case for a reduction in import duties on raw materials used by the industry but says that if Indian fans, when there is an exportable surplus, meet with strong competition in external markets the matter would be favourably considered by the Government.

Attention was drawn by the Board to complaints by Government Departments and other purchasers of the need for better construction and finish in Indian-made fans. It was also recommended that the Indian Standards Institution should be asked to expedite the formulation of specifications for all types of fan now being made in India.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

The Telegraph Construction & Maintenance Co., Ltd., reports group profits for 1951 of £570,076. This figure is arrived at after allocating £56,086 to research, etc., and including £70,000 gross investment income and £45,000 provisions freed. The figure for 1950 was £391,961. After deducting £90,844 for depreciation, £234,214 for taxation and £18,718 for pensions, etc., there is a net profit of £226,300 (against £173,713). From this the following deductions are made :—Replacement of assets, £50,000; to value of stocks, £25,000; depreciation reserve, £25,000; research and development, £70,000. The final ordinary dividend is 5 per cent, making 10 per cent for the year. The total distribution for 1950 was 11 per cent, which included 1 per cent from the special dividend reserve set aside in 1949. The balance carried forward is £86,961 (against £32,212 brought in).

The Brush Electrical Engineering Co., Ltd.—At an extraordinary meeting held on 12th March, resolutions were passed increasing the authorized capital to £5,000,000, agreeing to the issue of 660,000 £1 preference shares, and making minor amendments to the articles to safeguard the rights of the new stockholders. The offer made to preference holders of the National Gas & Oil Engine Co., by the Brush Co., has now become unconditional, 90 per cent of the holders of National preference shares having accepted the offer.

The company proposes to pay a final ordinary dividend of 6 per cent, making 10 per cent for 1951 (unchanged). The Brush Aboe group's preliminary figures for the year show a trading profit of £2,566,433, an increase of £180,449, and a net profit of £1,667,624, an increase of £21,554.

Bakelite, Ltd.—Application has been made to the London Stock Exchange for permission to deal in and a quotation for the whole of the issued shares. As a preliminary to this operation, the present issued capital of £750,000 in £1 ordinary shares is to be doubled by the capitalization of reserves for the scrip bonus. The £1 shares are to be split into shares of 10s. The new shares will not be entitled to any dividend in respect of the year 1951.

The Greengate & Irwell Rubber Co., Ltd.—Proposals for reorganizing the capital have been announced. It is proposed to convert the issued 375,000 16s ordinary shares into £300,000 of ordinary stock and the issued 275,000 1s deferred into £13,750 of ordinary stock. This will be followed by the capitalization of £573,750 of revenue reserves for a distribution of 2,868,750 ordinary shares of 4s each (on issue they will be converted into £573,750 of ordinary stock), which will be issued as to 2,250,000 shares to holders of the existing 375,000 ordinary on the basis of six for every 16s ordinary previously held; and as to 618,750 shares to holders of the existing 275,000 deferred shares on the basis of nine for four.

Switchgear & Cowans, Ltd., report a net profit for 1951 of £88,316, as compared with £64,272 for 1950. Taxation absorbs £51,000, and it is proposed to pay a dividend for the year of 20 per cent, plus a bonus of 2½ per cent, maintaining the distribution for the year at 22½ per cent. The balance carried forward is £67,033 (against £47,536 brought in).

A. H. Hunt (Capacitors), Ltd.—In his statement which accompanies the report and accounts Mr. S. H. Brewell (chairman and managing director) says that throughout the year under review the business grew steadily and in July last steps were taken to provide further working capital of £50,000 to help finance this additional business. The Wrexham works have been further expanded and a new and longer lease has been arranged in connection with the Wandsworth premises. The trading figures for the first two months of 1952 are satisfactory.

The Rheostatic Co., Ltd., reports a net profit for the year ended 30th September last of £37,742, as compared with £31,308 for 1949-50. General reserve receives £36,000 of which £16,553 is tax provision no longer required. The final dividend is 12½ per cent making 16½ per cent for the year. The balance carried forward is £6,125 (against £6,360 brought in).

R. B. Pullin & Co., Ltd., report a net profit for the year to 30th September last, subject to audit, of £67,000. The dividend for the year is unchanged at 15 per cent.

E. K. Cole, Ltd., have declared an interim dividend of 10 per cent actual. This is at the same rate as last year, but is payable on increased capital.

Aberdare Cables (Holdings), Ltd., has declared a second interim dividend of 10 per cent (same).

New Companies

A. R. Hillier & Co., Ltd.—Registered 27th February. Capital £40,000. To carry on the business of dealers in radio, television and electrical apparatus of all kinds, etc. Directors : A. R. Hillier, G. Gooding, A. E. Andrews and R. G. Smith. Regd. office : 13/14, New Road, Gravesend, Kent.

Audionics, Ltd.—Registered 25th February. Capital £100. Manufacturers of and dealers in wireless apparatus, etc. Directors : I. C. Humphreys and H. Brandes. Regd. office : 157, High Holborn, W.C.1.

F. E. Derbyshire, Ltd.—Registered 25th February. Capital £800. Manufacturers of and dealers in electrical and mechanical apparatus, accessories and components, wireless sets, etc. Directors : F. E. Derbyshire and Phyllis Derbyshire. Regd. office : 34, Thameshill Avenue, Romford, Essex.

C. M. Piffard & Co., Ltd.—Registered 28th February. Capital £100. Electrical engineers and contractors, etc. R. M. Piffard is governing director. Regd. office : 2, Holloway Head, Birmingham.

H. V. Colman & Co. (Electrical Contractors), Ltd.—Registered 28th February. Capital £2,000. Electrical engineers and general electrical installation contractors, lighting specialists, radio and television engineers, etc. Directors : H. V. Colman (managing director), H. A. V. Gardiner, Jean E. Colman and Joan M. Gardiner. Regd. office : 1, Bordesley Street, Birmingham, 5.

Drury & Beardow, Ltd.—Registered 28th February. Capital £10,000. To enter into an agreement with H. W. J. Drury and A. J. Hallett, to acquire the business of radio, television and electrical equipment traders, formerly carried on by them, as "Drury & Beardow," at 34 and 36, Station Road, Chadwell Heath, Essex. Directors : H. W. J. Drury and A. J. Hallett. Solicitors : R. C. Bartlett & Co., 27, John Street, W.C.1.

Lawrence Farnworth & Sons, Ltd.—Registered 29th February. Capital £3,000. Electrical engineers and contractors, etc. L. Farnworth is the first director. Regd. office : 44, Bolton Road, Walkden, Lancs.

Walter Collins (Electrical Appliances), Ltd.—Registered 29th February. Capital £100. Manufacturers of and dealers in electrical fittings and appliances of all kinds, etc. W. Collins is permanent director. Regd. office : 50, Ladbury Road, W.11.

H. L. Prior & Co., Ltd.—Registered 5th March. Capital £1,000. Electricians, mechanical engineers, dealers in electrical apparatus, radio and television manufacturers, etc. Directors : H. L. Prior and Mrs. Agnes E. Prior. Regd. office : 23, Northgate Street, Great Yarmouth.

Increases of Capital

Associated Electrical Industries, Ltd.—Increased by £8,000,000, in 5,000,000 ordinary and 3,000,000 unclassified shares of £1 each, beyond the registered capital of £10,000,000.

Whitworth Electric Lamp Co., Ltd.—Increased by £40,000, in 20,000 "A" and 20,000 "B" shares of £1 each, beyond the registered capital of £60,000.

Porn & Dunwoody, Ltd.—Increased by £50,000, in £1 ordinary shares, beyond the registered capital of £10,000. The capital has been reorganized and is now £60,000, in 6,000 8 per cent and 54,000 ordinary shares of £1 each.

West Insulating Co., Ltd.—Increased by £3,500, in 2,800 4 per cent redeemable preference and 700 ordinary shares of £1, beyond the registered capital of £1,500.

Liquidations

Harris & Stacey, Ltd.—Winding up voluntarily. Liquidator, Mr. R. A. Haigh, Court Chambers, Friar Lane, Leicester. Particulars of claims to the liquidator by 30th April.

Barking Electrical Co., Ltd. — In voluntary liquidation. Meeting of members and creditors on 16th April at 11-12, Finsbury Square, London, E.C.2, to receive an account of the winding-up by the liquidator, Mr. N. Osborne.

Bankruptcies

C. R. Boydon, Ivy House, Thorpe Mandeville, Banbury, Oxon, electrical engineer.—First meeting held 20th March. Public examination 16th May at the Town Hall, Banbury.

A. J. Martin, lately carrying on business at High Street, Stalham, Norfolk, electrical engineer and wireless dealer.—First meeting to-day (Friday) at the Official Receiver's office, Castle Chambers, Opie Street, Norwich. Public examination 24th April at the Town Hall, Great Yarmouth.

G. L. Milton and **A. Coates,** formerly carrying on business in partnership under the style of "Electro Radio" at 44, High Street, Buxton, Derbyshire.—First and final dividend of 1s 4¼d in the £ payable from to-day (Friday) at the Official Receiver's office, 20, Byrom Street, Manchester.

D. N. Bateman, residing and lately carrying on business under the style of "Villiers Electric," at 1, North Villiers Street, Leamington Spa, radio and electrical engineer.—First and final dividend of 1s 6½d in the £, payable from 7th April at the Official Receiver's office, Somerset House, 37, Temple Street, Birmingham, 2.

STOCKS and SHARES

THE accompanying price lists cover this week the market reactions to the Budget. Very few prices have escaped the natural consequences of an increase in Bank Rate. As always, it was the popular industrial market leaders which moved in closest correspondence with the rise in the gilt-edged yield basis. In the electrical market, the result is seen in falls of 4s or more in A.E.I. and English Electrics, while General Electrics shed 3s 9d. Of the three, only English Electrics stand now to yield less than 6 per cent. Tube Investments have lost 3s 9d and Chloride Electrics a similar amount. Among the many which were marked down by 1s to 2s are E.M.I., Pye, Automatic Telephone, Lucas and most of the cable manufacturers' shares. The excellent results reported by the Telegraph Construction & Maintenance Co. did not prevent a fall of 9d in the shares, to 34s 3d.

Excess Profits Levy

Attempts to calculate the effect of the new Excess Profits Levy on individual companies run into unknown factors which permit few precise answers, but they lead to the general conclusion that, in itself, the E.P.L. does not constitute a very serious threat to the latest dividend rates on the leading investments in the electrical equipment and other sections of the industrial market. From the Chancellor's estimate of a net gain of a hundred millions from the Levy, less the profits-tax concessions, the impost is shown to be far from insignificant. In principle, it is open to heavy criticism, and in detail it is severe in taking the average profits of the three years 1947–49 as the standard above which earnings become liable to the 30 per cent deduction. In the case of a company which has not increased its profits excessively over the past few years, however, and has kept much of them in the business, shareholders appear to have a fair chance of seeing distributions maintained (other things being equal). After the appearance of the Finance Bill, it should be possible to examine particular cases in some useful detail.

Gilt-edged Reaction

In the long run, the fortunes of the gilt-edged market evidently stand or fall, to a large extent, on the restoration of confidence in the pound sterling; but, if a higher Bank Rate is chosen as one of the principal instruments to that end, the immediate consequences can only be a downward adjustment of Government security prices, to bring yields into line with other rates of borrowing. Fundamentally, this has come to be accepted as the explanation for the flat market reception of a Budget which, in principle, was generally approved in the City. Falls of between 1½ and 2 points in the three British Electricity stocks give the measure of the gilt-edged market's downward adjustment. Depreciation was heavier in the case of the "undated" issues, such as "Old" Consols and 3½ per cent War Loan. On such issues, the running yield has risen to about 4½ per cent. On the two 3 per cent British Electricity stocks, the return is now in the neighbourhood of 3¾ per cent, but there is the assurance of a capital gain (tax free) of 9 to 10 points by the time they fall due for repayment at par.

Brush Electrical Results

According to last week's preliminary announcement, the Brush Aboe group increased its sales during 1951 by over £4 million, or 20 per cent; but after increased costs and higher charges for taxation, interest and depreciation, the net profit attributable to Brush Electrical Engineering comes out rather lower than the previous year's, at £544,000. In maintaining the ordinary dividend at 10 per cent, however, the amounts distributed to preference and ordinary shareholders take only £156,000 net, leaving a surplus of the best part of £400,000 for reserves and other appropriations. Market reactions to the figures were obscured by last week's wider issues, the net result being slightly to lower the price of the 5s shares to 5s 3d. Particular difficulties seem likely to arise in any attempt to calculate the incidence of the Excess Profits Levy, since it was in the last of the three "standard" years that the company concluded the important deal with Associated British Engineering, which was followed by a capital issue for cash in 1950.

Decca and Ekco

Decca's offer of new 1s shares at 4s 6d to existing shareholders expires to-day (Friday). Before it closed, shareholders had the benefit of seeing the encouraging annual profits statement, and the latest dividend decision. The results, which disclose an 80 per cent increase in the trading profit, and a rise in group taxed income from £59,000 to £234,000, relate to the twelve months ended nearly a year ago, but the company reports further that another big rise in turnover points to a very satisfactory outcome to the period finishing this month. For the earlier year, the ordinary dividend is being maintained at a total of 112½ per cent, but for 1951–52 there is to be an increase in the first interim payment from 20·5/6 to 25 per cent. This payment will accrue to the new shares, on which the premium is now about 12s 9d. E.K. Cole have taken the hoped-for decision to repeat the interim dividend at 10 per cent on capital increased by a 25 per cent capital bonus since this time last year. This is taken to support market expectations of another total of 25 per cent for the full year.

Electrical Investments

Past Week's Price Changes

Company	Dividend Pre-vious	Dividend Last	Middle Price Mar. 17 1952	Week's Rise or Fall	Est. Yield p.c.
Overseas Electricity Companies			£ s d		
Atlas Elec. ..	3	4	17/6	−9d	4 11 5
Calcutta Elec. ..	6†	6†	20/-	—	6 0 0†
Cawnpore Elec. ..	—	—	26/3	—	—
East African Power	7	7	28/9	−⅛	4 17 6
Jerusalem Elec. ..	—	—	10/6	—	Nil
Madras Elec. ..	—	—	22/6	−9d	—
Nigerian Elec. ..	10	10	26/3	−3d	7 12 4
Palestine Elec. "A"	5†	5†	14/6	—	6 18 0†
Perak Hydro-Elec.	Nil	Nil	12/6	—	—
Equipment and Manufacturing					
Aberdare Cables(5/-)	20	20	12/-	+3d	8 6 8
Aerialite (1/-) ..	83½	88½	8/9	—	10 2 0
Aron Elec. Ord. ..	15	15	33/9	—	8 17 9
Assoc. Elec. Ord.	20	20	66/6xd	−4/9	6 0 3
Automatic Tel.& El.	12½	15	53/9	−⅛	5 11 6
Babcock & Wilcox	15	18	64/6	−3/-	5 11 6
Baldwin, H. J. (2/-)	25	25	5/-	—	10 0 0
British Aluminium	10	10	34/-	−9d	5 17 8
B.I. Callender's ..	6⅔	7½	26/-	−1/-	5 15 6
British Thermostat (5/-)	30	30	27/-	—	5 11 0
British Vac.Cleaner (5/-)	20	25	14/-	−1/-	8 18 6
Brush Ord. (5/-) ..	10	10	5/3	−3d	9 10 6
Burco (5/-) ..	42½	38¾	20/-	−9d	9 13 9
Chloride El.Storage	12½	15	56/3	−3/6	5 6 2
Cole, E. K. (5/-) ..	20	25	15/-	—	6 13 4*
Cossor, A. C. (5/-)	Nil	Nil	11/3	+3d	—
Crabtree (10/-) ..	17½	17½	32/6	—	5 7 9
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	8/9	−3d	6 8 9
De La Rue (5/-) ..	50	50	30/9	−3/-	8 2 8
Decca (1/-) ..	112½	112½	16/-xd	−6d	7 0 9
E.M.I. (10/-) ..	8	12	15/3	−6d	7 18 8
Electrical Components (5/-) ..	20	20	11/3	—	8 17 10
Elec. Construction	15	15	47/6	—	6 6 3
Enfield Cable Ord.	7½	7½	25/-	−1/-	6 0 0
English Electric ..	15	15	52/6	−4/3	5 14 3
Ericsson Tel. (5/-)	22†	22†*	36/3	−2/6	3 0 9†
Ever Ready (5/-)	35	35	25/-	−6d	7 0 0
Falk Stadelmann	15	15	40/-	—	7 10 0
G.E.C. Ord. ..	17½	22½	72/6	−⅝	6 4 3
General Cables (5/-)	38	30*	17/6	—	8 11 6
Greenwood & Batley	15	15	43/9	−⅛	6 17 0
Hackbridge Cable (5/-)	20	20	10/3	—	9 15 0
HackbridgeHewittic (5/-)	15	18	15/-	−6d	6 0 0
Hall Tel. Acc. (10/-)	10	10	11/6	−6d	8 13 10
Heatrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (5/-) ..	20	20	18/-	−6d	5 11 0
Hoover (5/-) ..	37½	35*	25/3xd	−1/6	6 18 7
Intl. Combustion (5/-)	20	25	20/3	−9d	6 3 5
Johnson & Phillips	15	15	47/6	−⅛	6 6 3

Company	Dividend Pre-vious	Dividend Last	Middle Price Mar. 17 1952	Week's Rise or Fall	Est. Yield p.c.
Equipment and Manufacturing (continued)			£ s d		
Lancashire Dynamo	22½	22½	40/-	—	5 12 6*
Laurence, Scott(5/-)	12½	12½	10/6	—	5 19 0
London Elec. Wire	10	10	37/6	−⅛	5 6 8
J. Lucas	17½	7½*	30/9	−1/9	4 17 5
Mather & Platt ..	11	12½	40/9	−3/-	6 2 9
Metal Industries ..	10	10	35/-	−9d	5 14 3
Mid. Elec. Mfg. ..	15	15	53/9	—	5 11 6
Murex	10	12½	45/6	−2/6	5 10 3
Newman Ind. (2/-)	10	6	2/9	—	—
Oldham & Son (1/-)	30	30	4/3	—	7 1 5
Parsons, C. A. ..	15	15	46/3	—	3 4 8*
Plessey (5/-) ..	20	22½	17/6	—	6 8 6
Pye Deferred (5/-)	35	18*	16/-	−1/-	5 12 6
Revo (10/-) ..	27½	27½	32/6	—	8 9 3
Reyrolle	15	15	41/3	−6d	3 12 9*
Scot. Cable (4/-) ..	30	30	19/9	−6d	6 1 7
Siemens Ord. ..	7½	10	32/6	−⅛	6 3 1
Switchgear & Cowans (5/-)	22½	22½	13/-	—	8 13 3
T.C.C. (10/-) ..	15	20	46/-	—	4 7 0
T.C. & M. ..	9*	10*	34/3	−9d	5 16 9
TelephoneMfg.(5/-)	10	10	7/6	—	6 13 4
Thorn Elec. (5/-)..	20	10*	7/9	—	6 9 0
Tube Investments	25	25	4½	−⅜	5 1 3
Vactric (5/-) ..	Nil	Nil	7/-	+3d	Nil
Veritys (5/-) ..	2½	Nil	3/6	—	Nil
Walsall Conduits (4/-)	70	70	48/9	—	6 0 2
Ward & Goldstone (5/-)	44	45*	36/3	—	6 0 0
Watford (2/-) ..	20	25	5/9	+3d	8 14 0
Westinghouse Brake	14	14	45/6	−2/-	6 2 10
West, Allen (5/-)	10	12½	10/-	—	6 5 0
Transport and Communications					
Anglo-Am. Tel.: A Ord.	—	—	84½	—	—
Ord.	—	—	58	—	—
Anglo-Portuguese	8	8	21/3	—	7 10 7
Brit. Elec. Traction: Def. Ord. ..	22½	25	365	−10	6 17 0
Cable & Wireless: Ord.	6	8	113¼xd	—	7 1 0
4% Loan ..	4	4	94½	−½	4 4 8
Calcutta Trams ..	6†	6†	23/-	—	5 4 4†
Cape Elec. Trams	4	5	14/-	—	7 2 9
Globe Tel. & Tel. Ord.	—	—	25/-	—	—
Great Northern Tel. (£10)	7½	8	11¼	—	7 2 3
Inter. Tel. & Tel.	Nil	15cts	34	+½	—
Marconi Marine ..	7½	10	28/9xd	−1/6	6 19 3
Oriental Tel. Ord.	16	16	46/3	—	—
Telephone Props.	7	8	30/-	+9d	5 6 8
Tele. Rentals (5/-)	10	10	7/6	−9d	6 13 4

* After capital bonus.
† Dividends are paid free of Income Tax.

I.E.E. North Western Centre

Electricity and the Textile Industry

HOW great has been the progress of electrification in the Lancashire cotton industry was the theme of the speeches at the annual dinner of the North Western Centre of the Institution of Electrical Engineers at the Midland Hotel, Manchester, on 11th March. There was a record attendance of about 400 persons. The guests included the Lord Mayor of Manchester and the Mayor of Salford. Mr. G. R. Polgreen presided.

Mr. W. Winterbottom, chairman of Fine Spinners and Doublers, Ltd., and president of the Yarn Spinners' Association, in proposing the toast of the I.E.E., said that there had been an unprecedented expansion of the use of electricity for driving textile machinery. In 1945 the sale of electricity to the textile industry in the area now covered by the North Western Electricity Board was 389 million kWh for the spinning, weaving and finishing sections, while in 1950 the sale was 718 million, an increase of 329 million. The corresponding figures for maximum demand were 192,000 kW and 338,000 kW, or 76 per cent.

Improved Working Conditions

One of the greatest difficulties—the repugnance of labour to enter the cardrooms of spinning mills—was being rapidly overcome by the far more congenial surroundings which resulted from modern electrically driven machinery and up-to-date lighting systems. Many machines were now appearing with driving motors and control gear built into them, a trend which was likely to develop quickly as it did in the machine tool trade. Probably all new installations of ring spinning frames and automatic looms had individual electric drives and there were innumerable ways in which the latest developments in electrical technology were being applied to machines and instruments in the textile industry.

At present-day costs and with the necessity for fuel economy, the efficient use of all steam was of primary importance. The prior use of process steam could provide a relatively cheap source of power in relation to such heat requirements. Developments on these lines would be very much facilitated if the disadvantage of keeping the public and mill supplies separate could be avoided so that the two supplies could operate in parallel and permit any surplus energy to be fed back to the mains and vice versa. There were electrical complications no doubt, but the matter would repay study in view of the urgent necessity to save fuel whenever possible. It was one of the ironies of the post-war world that the more progressive firms which had installed electric drives and improved their equipment had been handicapped by the inability of the electricity supply authorities to keep pace in winter with the demand. Actually, the experience this winter had been much better than they anticipated, or dared to hope, but no one wanted to see these load spreading arrangements part of the normal winter routine.

In his reply for the Institution, Sir John Hacking (President) referred to the importance of the electrical industry based in Lancashire, and the steps that were being taken to overcome the serious shortages of generating plant. The "pipe-line" at the end of the war, so far as new plant was concerned, was absolutely dry and although there might be relatively only a trickle of new plant now, last year there had been a notable improvement in deliveries in spite of the shortages of materials.

The ramifications of the electrical industry were constantly increasing and it was therefore important that there should be a succession of engineers of the standard required to carry the responsibilities which would fall upon them. The number of candidates for electrical engineering was still on the increase. The proportion of student members in comparison with graduates seemed to be lower in the North Western Centre area than in nearly all others. "Do what you can," said Sir John, "to get the younger members interested in the work of the Institution."

Use of Residual Steam

Mr. Winterbottom's suggestion about the use of residual steam in textile factories as a relatively cheap source of power was, Sir John feared, not practicable owing to the very low load factor. Steam would be available in the winter months, but not in the summer; consequently, the economics would not be good. Where there was an industrial installation that required process steam all the year round, then there would probably be a good case for "combined steam generation." In the circumstances mentioned by Mr. Winterbottom the operation of a large number of small supply plants would be attended by considerable danger if they all came on to the public electricity supply system at the same time.

Other speeches were made by Mr. G. R. Polgreen and Mr. John Coatman. Tributes were paid to the work of Mr. T. T. Evans (hon. secretary) and Mr. A. L. Green (assistant secretary) of the North Western Centre.

NEXT WEEK'S EVENTS

Monday, 24th March

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio Group. Informal lecture on "Stereophonic Sound Reproduction," by J. Moir and J. A. Leslie.

CHESTER.—Town Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "The Protection of Electrical Power Systems—A Critical Review of Present-Day Practice and Recent Progress," by H. Leyburn and C. H. W. Lackey. (Joint meeting with the North-Western Centre.)

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Informal lecture on "Radio-Controlled Models."

LUTON.—George Hotel, 8 p.m. A.S.E.E. Luton Branch. "Resistance Welding," by H. E. J. Butler.

NEWCASTLE-ON-TYNE.—At the Literary and Philosophical Society, Westgate Road, 6 p.m. I.E.E. North-Eastern Centre. "The Operation of Dunston Power Station," by A. Howell and J. B. Jackson. (Joint meeting with the North-Eastern Branch of the I.Mech.E.)

Tuesday, 25th March

HAMMERSMITH.—Windsor Castle Hotel, 134, King Street, W.6, 7.30 p.m. A.S.E.E. West London Branch. "Marine Radar," by F. H. Dale.

LEEDS.—College of Technology, 6.30 p.m. I.E.E. North Midland Education Discussion Circle. Discussion on "The Teaching of Fundamentals."

LONDON.—At the Royal Society of Tropical Medicine and Hygiene, Manson House, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "The Design and Application of a Portable Electrostatic Wattmeter," by F. R. Axworthy.

E.A.W. London Branch, 2.30 p.m. Visit to Pimlico district heating undertaking.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Supply Group. "The Design of High-Voltage High-Power Mercury-Arc Convertors," by Dr. Ing. H. von Bertele and R. Tucker.

NEWCASTLE-UPON-TYNE.—Connaught Hall, 7 p.m. I.E.E. North Eastern Centre. Lecture to Schools. "The Romance of Electricity," by Dr. P. Dunsheath. Jointly arranged with Institutions of Civil and Municipal Engineers.

Wednesday, 26th March

BELFAST.—Belfast Association of Engineers. "District Heating," by A. Stubbs.

FARNBOROUGH.—R.A.E. College, 7.30 p.m. I.E.E. Southern Centre. "Supertension Cables," by J. Banks.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "The Design of High-Speed Salient-Pole a.c. Generators for Water-Power Plants," by E. M. Johnson and C. P. Holder.

I.E.E. London Students' Section, 2.30 p.m. Visit to Lime Grove Studios, Shepherd's Bush.

Piccadilly Hotel, W., 12.15 for 1 p.m. Electric Light Fittings Association. Annual luncheon.

Lighting Service Bureau, 2, Savoy Hill, W.C.2. 6 p.m. Illuminating Engineering Society. Brains trust.

Waterloo Bridge House, S.W.1, 5 p.m. Institution of Post Office Electrical Engineers. Informal meeting. "The Provincial Exchange Area—Some Aspects of its Design and Development," by R. Thornton.

Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Address by the Rev. C. W. Armitage.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, Corporation Road, 6.30 p.m. I.E.E. Tees-Side Students' Section. "Power Factor Correction," by G. P. Cundall.

Thursday, 27th March

BIRMINGHAM.—M.E.B. Showrooms, Paradise Street, 7 p.m. E.P.E.A. Midland Technical Group. "Labour Relations in Industry," by V. R. O. Hutchinson.

HULL.—Y.E.B. Ferensway, 7.30 p.m. I.E.E. North Midland Centre. "Modern Developments in Electric Welding," by Dr. H. G. Taylor.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "The Field for College Laboratory Experiments on Modern Magnetic Materials," opened by Dr. L. G. A. Sims.

At the London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers. "Magnetic Amplifiers and their Applications to Industrial Processes," by H. M. Gale.

Friday, 28th March

BIRMINGHAM.—Imperial Hotel, Temple Street, 6 p.m. I.E.S. Birmingham Centre. "Light and Colour," by G. J. Chamberlin.

LONDON.—Storey's Gate, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. Annual general meeting.

Charing Cross Hotel, W.C.2, 7.30 p.m. Institute of Welding, South London Branch. Annual dinner.

39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. Informal meeting. "Centrifugal Pumps," by J. A. Cribb.

Connaught Rooms, W.C.2, 6 for 6.30 p.m. Batti-Wallahs' Society. Ladies' Night.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. Annual general meeting. "Training for Management," by F. C. Lawrence.

NEWCASTLE-ON-TYNE.—Liberal Club, 7 p.m. I.E.E. North-Eastern Centre. Informal meeting.

King's College, 6.30 p.m. I.E.E. North-Eastern Students' Section. The Students' Lecture. "Switchgear," by L. Drucquer.

STOKE-ON-TRENT.—M.E.B. Showrooms, Kingsway, 7 p.m. E.P.E.A. Midland Technical Group. A paper on the visit of the British Team to American electricity supply industries, by R. Mallett. (Meeting postponed from 7th March).

Friday, 28th and Saturday, 29th March

LONDON.—Royal Horticultural New Hall, Greycoat Street, S.W.1. Association of Supervising Electrical Engineers. First Central Regional Council Electrical Engineers' Exhibition.

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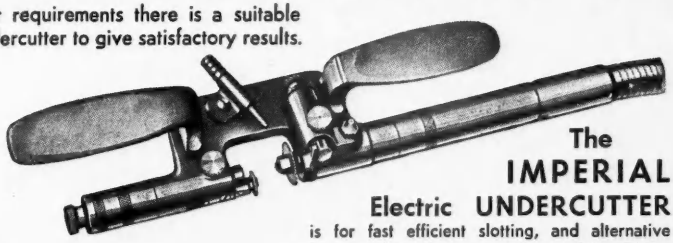

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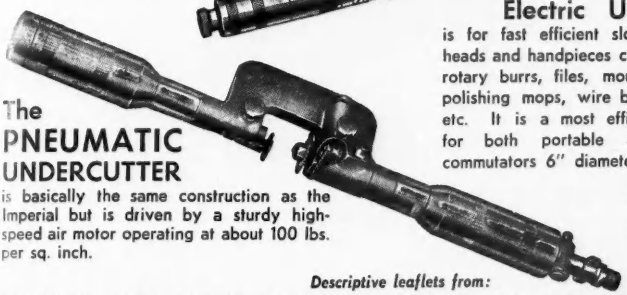

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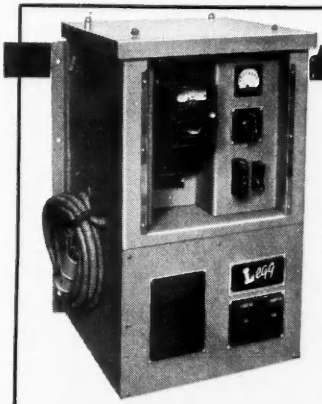

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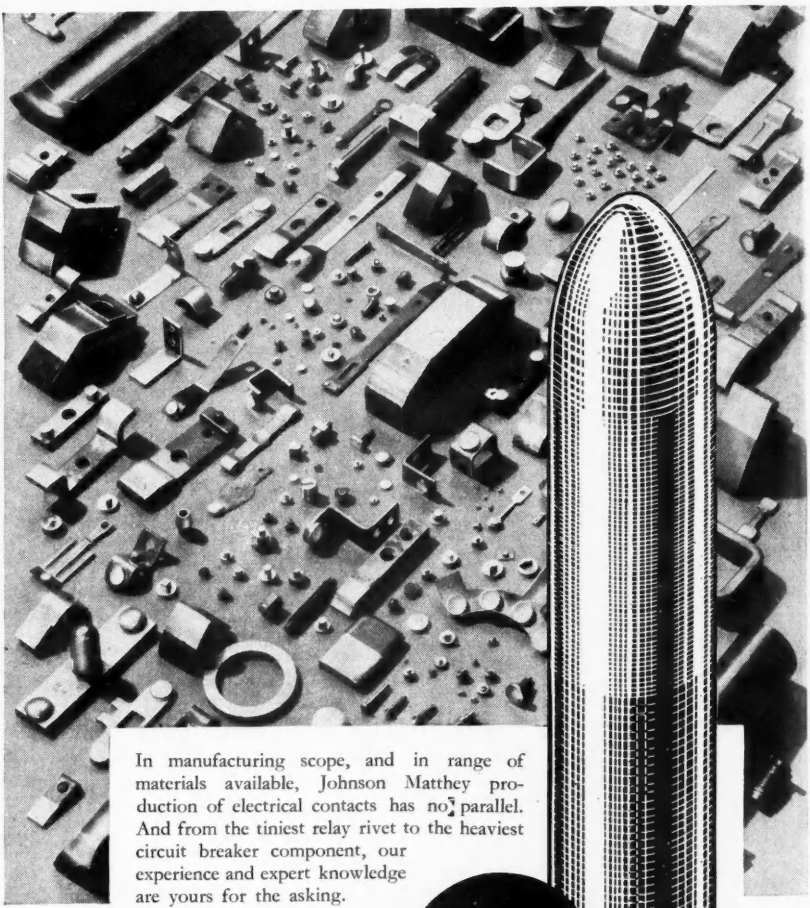

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 30th April from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

1[illegible]85. M-O. Valve Co., Ltd., and Willshaw, W. E.—Apparatus for amplifying or multiplying the frequency of electrical oscillations of high frequency. 6th August, 1947. (671219.)

1[illegible]17. Gall, D. C.—D.c. electrical measuring apparatus. 2nd June, 1947. (670871.)

1947

1[illegible]96. Soc. d'Exploitation de Brevets.—Commutator electric machine. 15th January, 1947. (671321.)

1948

11237. British Thomson-Houston Co., Ltd., Graham, H. B., and Tabberer, G.—Turbine type starters for internal-combustion engines. 29th March, 1949. (671214.)

18792. International Business Machines Corporation.—Devices for the control of electrical circuits according to a predetermined programme. 13th July, 1948. (671330.)

20086. Faudell, C. L.—Scanning coils for cathode-ray tubes. 12th July, 1949. (671331.)

20750. Radio-Industrie.—Analyser tubes for X-rays and other radiations. 5th August, 1948. (670875.)

23133. Holden, A. de F.—Electrode type salt-bath furnace. 2nd September, 1948. (671333.)

21549. Philips Electrical, Ltd.—Means for generating oscillations at equally spaced frequencies. 20th September, 1948. (670877.)

21822. Akt.-Ges. Brown, Boveri & Cie.—Circuit for the introduction of electrons into an electron accelerator. 22nd September, 1948. (671335.)

27276. Duyck, G.—Electromagnetically synchronized clutches and detents. 20th October, 1948. Convention date not granted. (670959.)

27385. Sperry Corporation. — Distance-difference measuring systems employing electromagnetic waves. 21st October, 1948. (671037.)

28301. Metropolitan-Vickers Electrical Co., Ltd., and Scholes, G. J.—Power supply units. 21st October, 1949. (670961.)

28698. British Thomson-Houston Co., Ltd.—Pulse discriminators. 4th November, 1948. (670878.)

29919. Goldstaub, H. H.—Thermostatically operated electric switches. 19th December, 1949. (671039.)

30341. Soc. Francaise Radio-Electrique.—Electromagnetic relay arrangements. 22nd November, 1948. (670963.)

30739. British Thomson-Houston Co., Ltd.—Frequency regulating systems. 26th November, 1948. (671340.)

31449. International Business Machines Corporation.—Electronic counters. 4th December, 1948. (671341.)

31740. Fisher, S. N.—Domestic washing machines, wash-boilers, and like apparatus. 7th March, 1950. Cognate application 24121, 20th September 1949. (671343.)

32764. Cathodeon, Ltd., and Whiting, K. W.—Television pick-up tube circuits. 15th December, 1949. (671344.)

1949

1095. Day, J. R.—Sawtooth frequency modulator. 11th January, 1949. (670967.)

1112. British Thomson-Houston Co., Ltd., and Dyer, G. H.—Electrical capacitors. 11th January, 1950. (671347.)

2185. Mains Time Co., Ltd., and Moore, C. E.—Synchronous-motor driven electric clocks. 23rd January, 1950. (670972.)

2674. Minister of Supply.—Transmitter-receiver radio communication systems. 27th January, 1950. (671135.)

2768. Automatic Electric Laboratories, Inc.—Switches of the cross-bar type. 1st February, 1949. (671218.)

3002. Modern Telephones (Great Britain), Ltd.—Intercommunication telephone systems. 3rd February, 1950. (671348.)

7199. British Thomson-Houston Co., Ltd., Walker, J. H., and Gibbs, W. J.—Frequency changers. 21st February, 1950. (671164.)

7463. Noyes, R. C. (Hanovia Chemical & Manufacturing Co.).—Electrical discharge devices. 18th March, 1949. (671352.)

7481. General Electric Co., Ltd., and Croft, E. H.—Electric motor control systems. 20th March, 1950. (670879.)

7748. Bailey Meters & Controls, Ltd.—Measuring instruments for steam generators. 22nd March, 1949. (670880.)

9493. Strong, H. V., and Eisler, P.—Electric fuses. 4th April, 1950. (670926.)

9525. Directie van de Staatsmijnen in Limburg.—Process for the electric welding of cylindrical work pieces such as tubes and the like. 7th April, 1949. (671115.)

9690. Winther, M. P.—Magnetic clutches, brakes, or the like. 9th April, 1949. (671219.)

10355. British Thomson-Houston Co., Ltd.—Electric heating elements. 19th April, 1949. (671117.)

12061. Hendrey, R. J.—Electrical slip ring assemblies. 3rd May, 1950. (670988.)

12581. British Thomson-Houston Co., Ltd., and Holbrook, H. S.—Electric voltage regulators. 9th March, 1950. (671044.)

14083. United Insulated Co., Ltd., and Hiles, E. J.—Arrangement of an electric circuit making or circuit breaking device. 26th May, 1950. (671048.)

14741. Farbenfabriken Bayer.—Magnetic sound recorders. 17th May, 1950. (670993.)

15181. Dowty Equipment, Ltd., and Snell, M. S.—Inertia-operated electric switches. 2nd June, 1950. (671050.)

15645. Kaelin, P.—Registering devices especially for telephone plant. 13th June, 1949. (671052.)

15702. British Thermostat Co., Ltd.—Electric time switches. 13th June, 1950. (671053.)

16683. Fielden (Electronics), Ltd., Fielden, J. E., and Evans, J. C.—Sound reproduction. 20th June, 1950. (671056.)

16839. British Thomson-Houston Co., Ltd.—Electric flat-irons. 24th June, 1949. (671057.)

17041. Simplex Electric Co., Ltd.—Thermally operated electric switches. 21st June, 1950. (671058.)

18268. British Thomson-Houston Co., Ltd.—Rotary-absorption dynamometers. 11th July, 1949. (671062.)

18856. English Electric Co., Ltd.—Electric transformers. 30th June, 1950. (671063.)

18955. English Electric Co., Ltd.—Control mechanisms for electric motor control gear. 18th July, 1950. (671065.)

21049. British Thomson-Houston Co., Ltd.—Magnetic cores for electromagnetic induction apparatus. 12th August, 1949. (671067.)

21208. Gold, S.—Electrically maintained pendulum motors, particularly for clocks. 15th August, 1950. Cognate application 4187, 17th February, 1950. (670995.)

22804. General Electric Co., Ltd., and Humphrey, R.—Thermostatic control means particularly for electric hand irons. 1st September, 1950. (671069.)

23298. General Electric Co., Ltd., Collett, E. W., and Robson, D. W.—Inductance coils. 8th September, 1950. (671071.)

24718. Electric & Musical Industries, Ltd.—Sawtooth current generators. 20th September, 1950. (670887.)

25056. General Electric Co., Ltd., and Rudge, T. R.—Apparatus for measuring the thickness of layers of non-magnetizable materials on magnetizable materials. 26th September, 1950. (671227.)

28583. Standard Telephones & Cables, Ltd.—Electron discharge apparatus. 3rd November, 1950. (671296.)

29613. English Electric Co., Ltd.—Electric motor control systems. 17th November, 1950. (671080.)

30496. Dion, G. H.—Electrical apparatus. 28th November, 1949. (671083.)

31043. British Thomson-Houston Co., Ltd.—Electric circuit control devices. 2nd December, 1949. (671303.)

31273. Radio Corporation of America.—High input impedance transistor amplifiers. 6th December, 1949. (671305.)

31550. British Thomson-Houston Co., Ltd.—Safety gaps for the protection of electrical circuits. 8th December, 1950. (670892.)

31980. Schorg, C.—Means for improving the power-factor in induction heating apparatus. 13th December, 1949. (671310.)

31988. British Thomson-Houston Co., Ltd.—Cooling of electrical apparatus. 13th December, 1949. (671311.)

32247. Wellman Smith Owen Engineering Corporation, Ltd., and Ross, E. G.—Dynamo-electric machines which may also be employed as eddy-current couplings and dynamometers. 12th December, 1950. (671314.)

1950

47. Duprat, J. L.—Electric water heating taps. 2nd January, 1950. (670893.)

325. Telefonaktiebolaget L. M. Ericsson.—Glow-discharge tube with a movable probe. 5th January, 1950. (671233.)

707. Standard Telephones & Cables, Ltd.—Microphones of the carbon granule type. 11th January, 1950. (671126.)

969. Grisley, F.—Variable thermostat. 14th January, 1950. (671239.)

1075. British Thomson-Houston Co., Ltd.—Treatmen of resinous surfaces. 16th January, 1950. (670897.)

2362. Aircraft-Marine Products, Inc.—Electrical eyelet cable connectors. 30th January, 1950. (671246.)

2370. Compagnie des Freins & Signaux Westinghouse.—Capacity meters for measurement of low electric capacitance values. 30th January, 1950. (671133.)

2746. British Thomson-Houston Co., Ltd.—Control systems. 2nd February, 1950. (671136.)

3020. Hazeltine Corporation.—Pulse-signal discriminating system. 6th February, 1950. (671138.)

3740. Standard Telephones & Cables, Ltd.—Radio diversity receiving system. 14th February, 1950. (671143.)

3793. Compagnie Générale de Télégraphie sans Fil.—Radar system. 14th February, 1950. (671146.)

5121. Soc. Anon. pour les Applications de l'Electricité et des Gaz Rares-Etablissements Claude-Paz et Silva.—Circuit arrangements for starting and feeding two electric discharge apparatus. 28th February, 1950. (671155.)

5219. Metropolitan-Vickers Electrical Co., Ltd.—Magnetic suspensions. 1st March, 1950. (671249.)

5292. Electric Storage Battery Co.—Vent plugs for electric accumulators. 2nd March, 1950. (670911.)

6245. Wildhack, W. A.—Mechano-electric transducers. 13th March, 1950. (671160.)

6844. Perma Soc. Anon.—Bimetal strip thermostatic switches. 20th March, 1950. (671163.)

6984. Welwyn Electrical Laboratories, Ltd. (Soc. Anon. de Participation Etrangere).—Methods of manufacture of electrical resistors. 21st March, 1950. 671262.

7040. Du Mont Laboratories, Inc., A. B.—Correcting position of undeflected spot on multi-gun cathode-ray tube. 21st March, 1950. (670912.)

7407. Ateliers de Constructions Electriques de Charleroi.—Device for measuring the internal temperature of a static condenser operating at industrial frequency. 24th March, 1950. (671090.)

8158. Barbera, C. U.—Switch for obtaining periodical electrical interruptions and commutations. 31st March, 1950. (670918.)

8859. Philips Electrical Industries, Ltd.—Thermionic valve amplifiers. 11th April, 1950. (671102.)

10502. McLellan & Co., Pty, Ltd., W. J.—Electric soldering iron. 28th April, 1950. (671272.)

10534. Lumalampan Aktiebolag.—Tubular electric incandescent lamp. 28th April, 1950. (671169.)

11457. Cinch Manufacturing Corporation.—Holders for thermionic valves or like electrical appliances having projecting prongs and contacts for said holders. 8th May, 1950. (671276.)

13487. Lumalampan Aktiebolag.—Leading-in units for electric lamps. 30th May, 1950. (6711178.)

14836. Westinghouse Electric International Co.—Television receiving apparatus. 14th June, 1950. (671288.)

15362. Westinghouse Electric International Co.—Safety devices for elevator systems or the like. 20th June, 1950. (671286.)

16765. Pickering, A. V.—Systems of underground communication. 5th July, 1950. (671188.)

17454. Standard Telephones & Cables, Ltd.—Electric frequency modulated oscillators. 12th July, 1950. (671194.)

17563. British Thomson-Houston Co., Ltd.—Means for measuring the resistance of alternating current apparatus. 13th July, 1950. (670943.)

18150. British Thomson-Houston Co., Ltd.—Hall plate apparatus for measuring or controlling unidirectional currents. 20th July, 1950. (671198.)

19504. Standard Telephones & Cables, Ltd.—Electric impedance networks. 4th August, 1950. (671206.)

19846. Scarpa, G.—Winding section for high-voltage transformers. 9th August, 1950. (671287.)

20210. Allmanna Svenska Elektriska Aktiebolag.—Electric air-blast circuit breakers. 15th August, 1950. (671288).

20682. British Thomson-Houston Co., Ltd.—Electric heating appliances. 21st August, 1950. (671014.)

21455. British Thomson-Houston Co., Ltd.—Electrode structures for electric discharge devices. 30th August, 1950. (671210.)

26019. British Thomson-Houston Co., Ltd.—Thermostats. 25th October, 1950. (671027.)

28033. Willard Storage Battery Co.—Storage battery plates. 16th November, 1950. (671028.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 5th April :—

MAGAMP. No. 696,077, Class 9. Apparatus for use in timing processes and for use in controlling machines and motors, all being electrical apparatus operated by current control, voltage control or phase control; and relays and signal translating devices used in such apparatus.—English Electric Co., Ltd., Queen's House, 28, Kingsway, London, W.C.2.

RED ROSE CATHOWELD (design). No. 701,224, Class 9. Portable electrical appliances, parts and fittings, all included in Class 9.—G. K. Lancaster (London), Ltd., 50, George Street, Croydon, Surrey.

No. 702,191 (design), Class 9. Radio and television apparatus.—Link Sound & Vision Services, Ltd., 62, Brook Street, London, W.1.

BRUSH BAGNALL (design). No. B702,177, Class 12. Diesel-electric locomotives and electric locomotives.—Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough, Leicestershire.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—BRISBANE.—22nd April. City Electric Light Co., Ltd. Supply of lead covered cables and accessories. (C.R.E. 8973/52. Ten/3700.)* 1st May. Supply of 1,000 kVA auxiliary transformer. (C.R.E. 8607/52. Ten/3702.)*

28th May. State Electricity Commission of Queensland. Switchgear, lightning arrestors and fuses for the Burdekin River Authority. (C.R.E. 8405/52. Ten/3701.)*

Belfast.—10th April. Electricity Department. One 200 kVA static transformer and conveyor belting. (See this issue.)

Egypt.—CAIRO.—1st May. Cairo Electricity and Gas Administration. Supply of 118km of 600 V cable. (See this issue.)

Persia.—TEHERAN.—6th April. Ministry of Posts, Telegraphs and Telephones. Materials for the construction of long distance telephone and telegraph lines. (C.R.E. 7204/52. Ten/3692.)*

Romford.—7th April. Corporation. Electrical installations in houses and bungalows on Fuller's Farm and Hillfoot Road estates. (See this issue.)

Skelton and Brotton (Yorks). — 25th March. U.D.C. Installation of electrical fittings in 22 houses on the Wandhill Boosbeck estate. Surveyor, Council Offices.

South Africa.—KRUGERSDORP.—10th April. Municipality. Supply of transformers, h.v. and l.v. cable and switchgear. (C.R.E. 9729/52. Ten/3719.)*

Southport.—7th April. Corporation. Installation of Class "B" lighting on Heatherfield Road housing site. (See this issue.)

Sunderland.—9th April. Corporation. Electrical installation at hostel for aged persons. (See this issue.)

Uruguay. — MONTEVIDEO. — 17th April. Administracion General de las Usines Electricas y Telefonos del Estado. Supply of 345,000 metres of wire and 90,000 metres of cable, both with vulcanized rubber insulation. (C.R.E. 8578/52. Ten/3703.)*

Yorkshire.—7th April. West Riding County Council. Renewal of electrical installation at the Keighley Technical College and Grammar School. (See this issue.)

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashton-under-Lyne.—Shops (22) and flats (42), Crowhill and Taunton estates, and houses (104), Newmarket estate; borough surveyor.

Axminster.—Dwellings (46), Fox Hill estate; U.D.C. surveyor.

Billingham-on-Tees.—Houses (128) for the U.D.C. Builders: S. J. Boyd, Ltd., Emmerson Street, Middlesbrough (28); S. Coates, Ltd., Langbaurgh Place, Middlesbrough (50); and King & Sons, Westbourne Grove, Middlesbrough (50).

Blyth.—Bakery; Marshall & Tweedy, architects, 36, Blackett Street, Newcastle-on-Tyne.

Bolton.—Pathology laboratory, canteen and recreation room, District Hospital; F. Bradley, architect to Manchester Regional Hospital Board, 4, Wood Street, Bolton.

Bromley.—Houses (186), Hayes Place estate; borough surveyor, Municipal Offices.

Chichester.—Thoracic unit at St. Richard's Hospital; Saxon, Snell & Phillips, architects, 9, Bentinck Street, W.1.

Cockermouth. — Houses (36), Slatefell; North-Eastern Housing Association, Curzon Street, Maryport.

Consett.—Public library; J. J. Eltringham, Derwent Street, Blackhill, Consett, Co. Durham.

Coventry.—Flats (144), Bell Green, for T.C.; C. F. Redgrave & Son, architects, 6, Quadrant, Warwick Road.

Houses (100), Old Park Farm estate; D. W. Bridgwater, architect, 42, Bruton Place, W.1.

Crompton.—Houses (30); U.D.C. surveyor, Town Hall, Shaw, Oldham.

Croydon.—Primary school, Rowdown (£96,530); Lawson & Co., Ltd., builders, Park Road North, London, W.3.

Dagenham.—Chemical process building; May & Baker, Ltd., Rainham Road South.

Houses (46), Woodlands estate; C. S. Wiggins & Sons, builders, Hart Road, Thundersley.

Dudley.—Houses (220), Sledmere estate; Webb & Gray, architects, 200, High Street, Dudley.

Durham.—Provision of additional hutted accommodation at 18 schools for C.C.; county architect, Court Lane, Durham.

Grimsby.—Three-storey houses on Weelsby Road and Carr Lane estates; borough architect.

Guildford.—Houses (550), Park Barn extension; borough surveyor, Municipal Offices, High Street.

Hinckley.—Houses (60), on three estates; U.D.C. surveyor, 9, Station Road.

Hove.—Infant welfare centre, Hangleton, for West Sussex C.C.; Ringmer Building Works, Ltd., Ringmer, Lewes.

Hull.—Dwellings (43), Bilton Grange; A. E. Jenkinson, builder, 60, Anlaby Park Road North.

Ilkeston.—Houses (52), Kirk Hallam estate; borough surveyor, Town Hall.

Kent. — Secondary school, Broadstairs (£141,000), county primary school, Anerley (£41,500) and county primary at Sheerness (£72,600); county architect, Springfield, Maidstone.

Kidderminster.—College of further education, Hoo Road, for Worcs C.C.; F. Gibberd, architect, 8, Percy Street, London, W.1.

Liverpool.—Erection of chest clinic at Sefton General Hospital; T. N. Mitchell, regional architect, Church Street, Liverpool.

Rebuilding Holy Cross R.C. Church, Great Crosshall Street; Pugin & Pugin, architects, Harley Chambers, Old Hall Street, Liverpool.

Third instalment of C. F. Mott Training College; Norwest Construction Co., Ltd., Ruthven Road, Liverpool.

London.—HAMMERSMITH.—Flats (48), Blythe Road; borough engineer.

LEWISHAM.—Dwellings (90), Westwood Hill; borough architect.

Long Eaton (Notts). — New secondary modern school for Derbys E.C.; F. Perks & Son, Ltd., Long Eaton, Nottingham.

Houses (30), Petersham Road estate, for U.D.C.; A. H. Taylor & Son (Nottingham), Ltd., 151, Attenborough Lane, Attenborough.

Manchester.—Houses for T.C.: Brooklands estate (183); A. Locke, Ltd., 166, Lostock Road, Davyhulme. Bowlee (128); W. Hodgkinson, Ltd., 12, High Street, Buxton.

New office block and mustering hall for National Dock Labour Board; Wm. Thorpe & Sons, Ltd., Chester Road, Trafford Park, Manchester.

Middlesbrough.—Primary school, Green Lane; Leslie & Co., builders, Woodlands Road, Darlington.

Newcastle-on-Tyne.—Canteen and welfare block for British Glues and Chemicals, Ltd., Walker Road; J. W. Hanson & Son, architects, 123, Northumberland Street, Newcastle.

Newquay.—Houses (56), Doublestiles site; U.D.C. surveyor.

Northampton.—Milk processing and bottling plant, Heathfield Way, Dallington Fields; Daily Milk Co., Spencer Bridge Road.

New theatre at Creaton Sanatorium for Oxford Regional Hospital Board; F. H. Allen, architect, 24, Albion Place, Northampton.

North Riding.—Ambulance station, Bullamore Road, Northallerton; county architect, County Hall, Northallerton.

North Shields.—Extensions to premises in Saville Street for J. L. McAdam, Ltd.; W. Stockdale, architect, 73, Howard Street, North Shields.

Factory additions (10,000 sq ft) for Gregson & Co.; Jack Cotton, Ballard & Blow, architects, Haymarket House, Newcastle-on-Tyne.

Offices, Back Coach Lane, for Harding & Son; Haswell & Son, architects, 77, Tyne Street, North Shields.

Nottingham.—Houses (120), Fernwood estate, Wollaton; city housing architect, Guildhall.

X-ray department at Hospital for Women; Sheffield Regional Hospital Board, Fulwood House, Old Fulwood Road, Sheffield.

Peterborough.—Houses, Dogsthorpe North estate: J. W. Barber & Son, Ltd., Brewster Avenue, Woodston, Peterborough (24); H. R. Taylor, 23, Meadclose, Walton, Peterborough (36); S. B. Fairchild, 11, Welland Road, Peterborough (12); G. Matthews & Son, High Street, Eye, Peterborough (18); Charles W. Shelton, Ltd., 30, Westwood Park Road (80).

Plymouth.—Works extensions; Marshalls (Boxes), Ltd., Sutton Road.

Seaton Burn.—Central schools kitchen; county architect, County Hall, Newcastle.

Sheffield.—Secondary school for boys at Hurlfield; Hill & Roberts, Parsonage Street, Sheffield, 6.

Maud Maxwell Special School for Deaf; Ackroyd & Abbott, 47, Willoughby Street, Sheffield, 4.

Southampton. — Showrooms and offices; Stead & Simpson, Ltd., 12, Belgrave Gate, Leicester.

Staffordshire. — Proposed new branch libraries at Brownhills, Wednesfield, Biddulph, Rugeley, Aldridge, Chase Terrace and Pelsall; A. C. H. Stillman, county architect, County Buildings, Martin Street, Stafford.

Startforth (Yorks).—Houses (12) at Mickleton for R.D.C.; Boddy & Bell, architects, Thomas Street, Darlington.

Stoke-on-Trent.—Extensions to works for Twyfords, Ltd.; R. Scrivener & Son, architects, Howard Place, Hanley, Stoke-on-Trent.

Sunderland. — Houses (294), Castletown, Tunstall, Ryhope and Silksworth; R.D.C. surveyor.

Taunton.—Houses (100), Pyrland housing estate, stage two; borough housing architect.

Tynemouth.—Houses (12), Hotspur Street; B. Peel, Ltd., East Mill Works, North Shields.

Warrington.—Houses (35), Orford; Tomlinson & Wood, Ltd., Warrington.

Weardale. — Houses (40), Weardale and Frosterley, for R.D.C.; J. Lawton, architect, Council Offices, Stanhope, Co. Durham.

Wellingborough.—Houses (50), Croyland estate; Council's architect.

West Bromwich.—Houses and flats (90), Yew Tree estate; borough surveyor.

Works extensions; Kenrick & Jefferson, Ltd., High Street.

Workington. — Houses: Northside estate (110), Westfield estate (256) and Salterbeck (50); borough surveyor.

Worthing.—Flats (24), Pavilion Road and St. Elmo Road; Worthing Estates Building Co., Ltd., 72, Broadwater Road.